American Machinist
Volume 58 NEW YORK, APRIL 12, 1923 Number 15

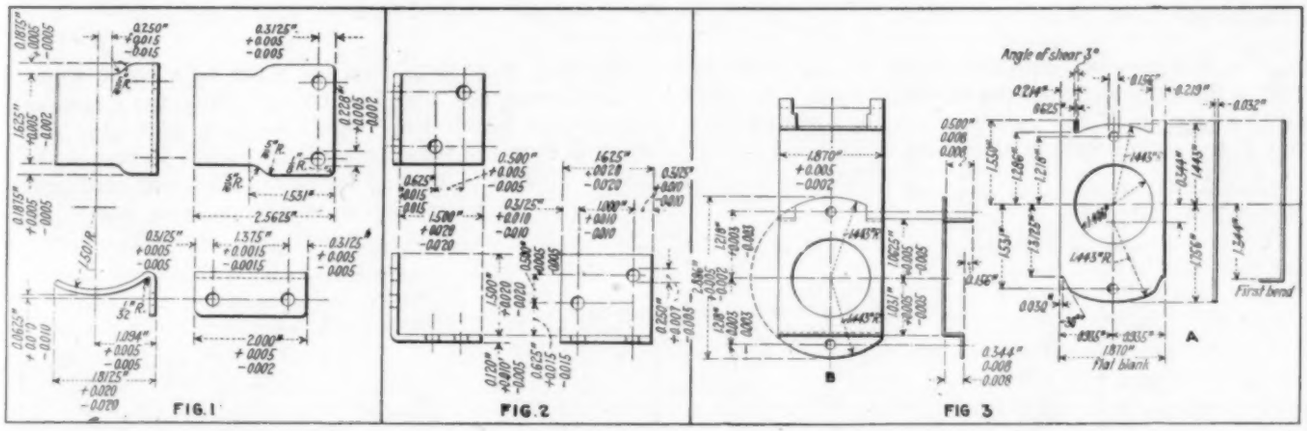
Combination Dies for Sheet-Metal Parts

By C. E. STEVENS
Chief Engineer, White Sewing Machine Company

Examples of work in which several operations were completed in one set of press tools—Complete data as to construction and operation

THE DIES DESCRIBED in this article were designed so that several operations could be done in each set and thus eliminate some of the handling of material that is always necessary and that is always objectionable in single-operation dies.

The parts shown in Fig. 1, 2 and 3 are all simple in design, but being used in large quantities a considerable amount of production cost was saved by making than in combination dies.



FIGS. 1, 2 AND 3—PARTS TO BE MADE IN COMBINATION DIES

Fig. 1 shows a metal bracket with limits that correspond with the average run of sheet metal work. The part in question was produced in the die shown in Fig. 4, in which *A* is a cast iron die shoe, cut out to receive die block *B*, forming block *C* and pressure block *D*. Die block *B* has two openings cut to receive trimming punches *E* which are identical in shape, one being right and one left, also two round piercing holes and two holes for pilots, the piercing holes being bushed.

Stripper *G* is ¼-in. cold-rolled steel, cut out to receive punches and pilots, and held in place by four ⅜-in. hex. head cap screws and four ⅜-in. dowels which extend through stripper, guides and die block, screwing into the cast iron die shoe. The guides *H* and *J* are ¼-in. in thickness, which allows ample room for feeding the stock. Back guide *H* extends beyond the end of die block *B* to assist in feeding the stock.

The pilots and piercing and trimming punches are all set in a machine-steel punch pad *K*, which is fastened to a cast-iron punch holder *L* with four ⅜-in. fillister-head screws and four ⅜-in. dowel pins. Cutting and forming punch *M*, is set between the step on punch holder *L* and edge of punch pad *K*, and held to punch holder *L* by four ¼-in. fillister-head screws. It is drilled to receive two kickers *N*, which are a sliding fit in punch *M* and act against a coil spring to strip the work from the punch after being formed.

In making forming punch *M*, the radius is slightly less than the finished part, which allows for a certain amount of recoil. The cutting edge is sharp while the forming edge has a ½-in. radius. The same procedure was followed when forming the radius on pressure block *D*. This block is a slip fit between die block *B* and forming block *C*, and is held in place by two shoulder screws *O*. Three square coil-springs are used for forming-pressure, and hold the blank from slipping while being formed.

In operating the die the stock is fed between the guides and held back against guide *H*. The distance between the guides at the starting edge of the die to the openings for trimming punches is ½-in. greater than the width of stock, while the remainder of the space, or from the trimming edges to the cutting edge of the

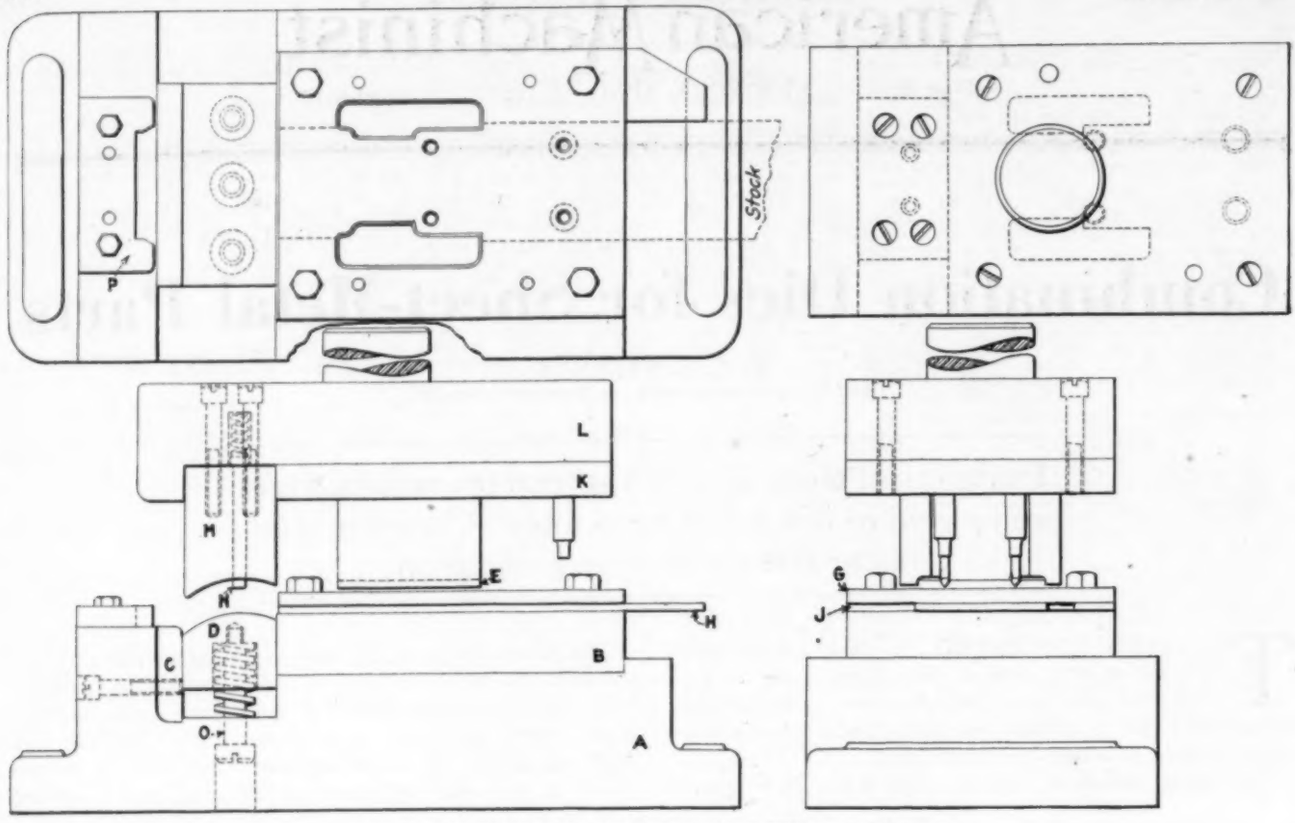
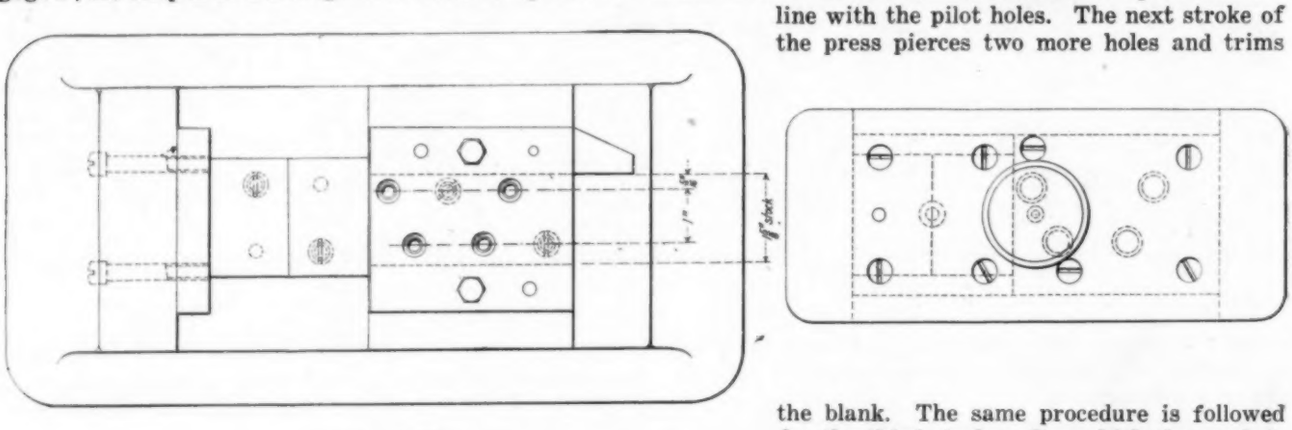


FIG. 4—COMBINATION DIE FOR PART SHOWN IN FIG. 1

die, the distance between the guides is but 0.005-in. greater than the width of the trimmed blank. By making this portion of the guides a fair fit, together with gage *P*, the strip is held in alignment while being cut off.

The first step is to feed the stock to a point about ½ in. beyond the piercing holes. Then the press is tripped, at which time two holes are pierced. The stock is then fed forward until these two pierced holes line with the pilot holes. The next stroke of the press pierces two more holes and trims



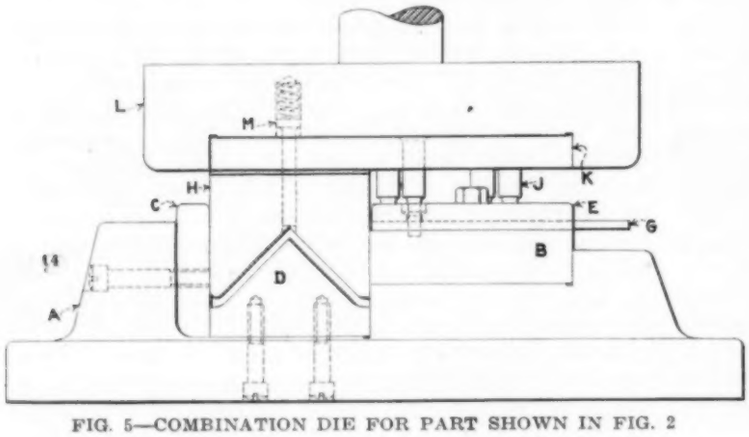


FIG. 5—COMBINATION DIE FOR PART SHOWN IN FIG. 2

the blank. The same procedure is followed for the third stroke, after which the stock is fed against gage *P* and a complete part is made at each stroke of the press and blown from the die by compressed air.

The trimming punches *E* are made with a heel which causes the punches to enter the openings before any cutting is done. Also, it will be noticed the pilots are of ample length and bring the stock in place before the trimming punches start to cut.

After the blank has been cut off by punch *M*, the press descends and block *D* is brought down against the cast-iron shoe, giving a solid base for forming. When the cutting die is reground the same amount is taken off of the bottom of block *D* and washers are

put under the head of shoulder screws *O* to bring the block to the correct height.

By running the press about 50 strokes per min., the operator was able to feed the stock, letting the press run continually for the full length of the strip, which in this case was 6 feet.

The piece shown in Fig. 2 is a bracket used in connection with a certain shipping crate, and the width was such that a 1⅝-in. strip stock could be used, the material being hot-rolled pickled steel.

The die used to produce this part is shown in Fig. 5 and was rigidly built to withstand heavy production.

A is a semi-steel die shoe, machined to receive die block *B* and forming blocks *C* and *D*. Die block *B* is made of tool steel and contains four piercing holes which are bushed so that the pierced holes could be kept to a given size. This block is fastened to the die shoe *A* with two ⅜-in. fillister-head screws from the bottom and two ⅜-in. hex-head cap screws and three dowels which enter from the top, which also hold stripper *E* and guides *G* in place. Both stripper and guides are made of cold-rolled steel, the stripper being ⅜ in. thick. The guides are ⅛ in. thick, the back guide extending beyond the edge of die block *B* to assist in feeding the stock.

Forming block *C* is made of tool steel, hardened, and is fastened to die shoe *A* with two ¼-in. fillister-head screws. This block is made ¼ in. higher than the top of die block *B* to act as a support for cutting punch *H*, also as a stop for stock.

Forming block *D* is tool steel, hardened, and held in place with two ¼-in. fillister-head screws and two ¼-in. dowels. The top of the angle or forming edge is the same height as the top edge of die block *B*.

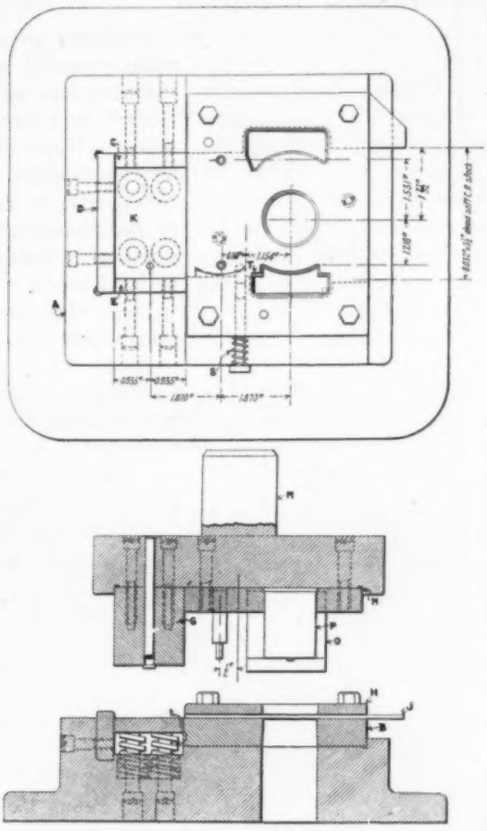
Four piercing punches *J* are held in a machine steel pad *K*, which is fastened to a semi-steel punch holder *L* with four ⅜-in. fillister-head screws and two dowels. The punch holder is milled to receive both punch pad *K* and punch *H*, the two being a tight drive fit in the milled slot.

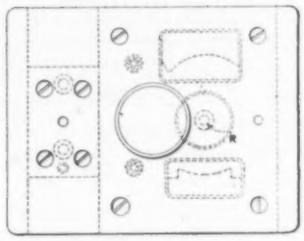
Punch *H* is made of tool steel, hardened, and is fastened to punch holder *L* with four ⅜-in. fillister-head screws and one dowel. It is drilled to receive kicker *M* which is a sliding fit in punch *H*, and being backed up with a coil spring acts as a knock-out for the formed piece. The cutting edge of punch *H* is ground at 3 deg. while the other edge has a ⅛-in. radius.

In feeding the stock, it is passed between guides *G* to about ⅛ in. beyond the cutting edge of die block *A*, and the first stroke of the press pierces four holes and trims the edge. The stock is then moved forward to block or gage *C* and each stroke thereafter makes a complete piece. The press runs fifty-five strokes per minute and is equipped with air, which blows the formed piece from the die, enabling the operator to keep the press running at a maximum rate until the strip is finished.

The part shown in Fig. 3 is an air deflector, and it was necessary to hold it to fairly accurate dimensions. This part was made in two operations. The first operation was to pierce, blank and form, as shown at *A*, while the second operation was to shear two lugs and complete the form as shown at *B*.

The die used in operation 1 is shown in Fig. 6, and is of the same general construction as the dies shown in Figs. 4 and 5. Cast-iron die shoe *A* is machined to receive die block *B* and forming blocks *C*, *D* and *E*. Die block *B* is made of tool steel, and contains two trimming openings, large center hole and two small holes. The edge is ground and acts as a cutting edge for punch *G*. Stripper *H* and stock guides *J* are cold-rolled steel and all three members are held in place by four





⅜-in. hex-head cap screws and two dowels. The screws extend through the stripper guides, and die block and are threaded into the cast-iron die shoe. Two ⅜-in. fillister-head screws enter from the bottom and help hold the die block in place.

FIG. 6—FIRST OPERATION DIE FOR PART SHOWN IN FIG. 3

Forming blocks *C*, *D* and *E* are tool steel, and each held in place by two ¼-in. fillister-head screws, blocks *C* and *E* being the same height as die block *B*, while block *D* is about ¼ in. higher to act as a support for cutting punch *G*, also as a stop for the stock.

Pressure pad *K* is tool steel and contains one pilot for locating the part and holding while forming. This block is a snug fit in the space made by the blocks *C*, *D*, *E* and *B*, and is held in place by four shoulder-screws *L*. Four coil springs are used to give pressure for forming and holding the blank flat and in place.

A cast-iron punch holder *M* is milled to a snug fit for punch *G* and punch pad *N*. Punch *G* acts as a cutting off and forming punch. The cutting edge is sharp while the other three edges have a slight radius. The punch is fastened to punch holder *M* with four ¼-in. fillister-head screws and one ¼-in. dowel. The small piercing punches are made sleeve type, by making the bodies of drill rod of substantial size and drilling for an insert of the size required for piercing. By this method stronger punches are obtained and in case of breakage the replacement is less expensive than the solid type. Another advantage is that an accurate alignment is maintained, due to the fact that the large body of the punch does not have to be taken out of the pad, which would distort the pad more or less.

The trimming punches *O* are both made with heels to allow the backs to enter the dies before any cutting is done, thus preventing spreading. Center punch *P* is drilled for a small spring kicker *R*, which is used to prevent the piercing following the punch out of the die as the opening gets larger due to grinding. The trimming and piercing punches are set in pad *N* and riveted over to prevent pulling out.

In operating the die the stock is fed to point *T*, shown in the plan view. The first stroke of the press pierces the center hole and trims the blank to shape at the ends.

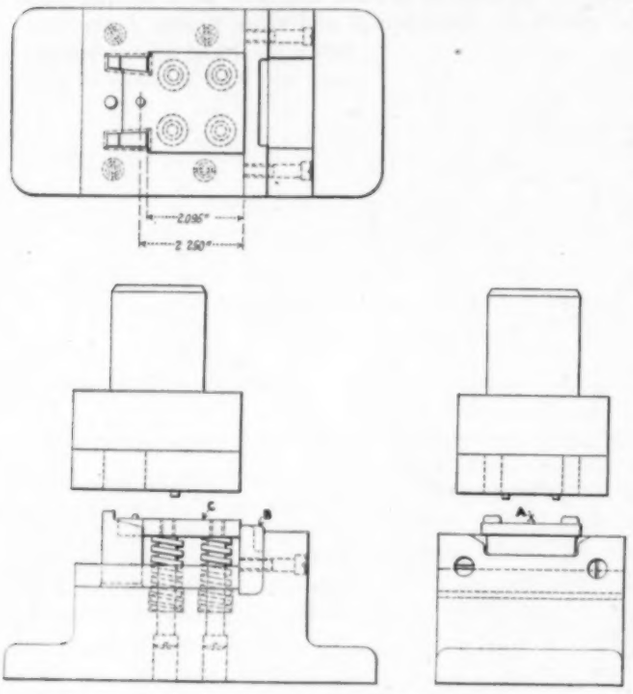


FIG. 7—SECOND OPERATION DIE FOR PART SHOWN IN FIG. 3

The stock is then fed forward and stop *S* is used as shown by dotted lines. This stop is held in by the operator and held out by a small coil spring. The second stroke of the press repeats stroke one, and in addition pierces two small holes and trims the edge. The stock is then fed to block *D*, and each stroke produces a piece as shown at *A*, Fig. 3.

The distance between stock guides *J* at the starting portion, or part before the trimming punches, is ½ in. wider than the width of stock, while the part following the trimming punches has a diameter 0.005 in. greater than the trimmed blank. This is to align the strip for piercing. The press is equipped with an air blast which blows the formed piece from the die, getting maximum production at all times.

The second operation is done in the die shown in Fig. 7, the shearing punches being fastened to the die shoe while the shearing die is fastened to the punch holder. The shearing punches have a heel on each punch and a shearing angle of 15 deg., which shear and form the lugs as at *B*, Fig. 3. The blank or part to be formed is placed on pilot *A*, while the formed end is placed in the slot of block *B*, which is a slip fit for the blank as formed in Operation 1.

Pressure pad *C* is held in place with four shoulder screws, and pressure is applied by four square coil-springs which hold the part flat and bring it from the lower die after being formed. Two spring kickers are placed in the upper die. The shearing being done on a 3-deg. angle, the part readily drops from the upper die after being started by the kickers. The press for this operation is tilted back at an angle, and the formed part drops in a box behind the press.

There are many press parts that can be produced on dies of this type, and costs lowered. Another advantage is the saving of stock, as no web is required between blanks, which is the case when a regular blanking die is used.

Cylinder Grinding in Auto Repair-Shops

BY FRANK C. HUDSON

Cylinder grinding is undoubtedly growing in automobile repair work. This is particularly noticeable in the shops in the far west, both on the coast and miles inland as well. One reason is probably the fact that more mileage per year is gotten because of driving for twelve months under almost the same weather conditions. There is no laying a car up on jacks for three or four months as in some sections. This constant use gives the motors hard wear and cylinders have to be ground more in consequence.

It is also probable that the dry season allows more dirt to get into the motors through the carburetors and so score the cylinders. In fact tractor builders are very particular in this respect and go to considerable trouble and expense to put air cleaners on their motors. There are cases where a motor has been practically ruined in a single day's run where air cleaners are not used in dry sandy localities.

This brings us to the question of cylinder grinding itself and the number of cylinder grinding machines in this section is something that attracts attention.

Of course the work differs from that in a production shop and yet men become very expert in handling cylinder blocks. There is, of course, a difference of opinion as to the best wheel to use and we find alundum, carborundum and crystolon all having their advocates. Wheels from 30 to 36 and H, I or J grades are common, while 303 carborundum is a favorite with many. There seems to be no variation in wheels used on different cylinder blocks even though they may vary in hardness to some extent.

Manufacture of Scales and Balances, 1921

The Department of Commerce announces that according to reports made to the Bureau of the Census the value of products of establishments engaged primarily in the manufacture of scales and balances amounted to $15,885,000 in 1921 as compared with $20,641,000 in 1919, and $9,734,000 in 1914, a decrease of 23 per cent from 1919 to 1921, but an increase of 63 per cent for the seven-year period 1914 to 1921. In addition, scales and balances were also manufactured as subsidiary products by establishments engaged in other industries to the value of $433,000 in 1921, $786,000 in 1919, and $326,000 in 1914.

Of the 65 establishments reporting products valued at $5,000 and over in 1921, 13 were located in Illinois; 11 in New York; 9 in New Jersey; 4 each in Indiana and Ohio; 3 each in Michigan, Missouri, Pennsylvania, and Vermont; 2 each in Kansas, Kentucky, and Wisconsin; and 1 each in California, Colorado, Iowa, Massachusetts, Utah, and Washington.

Conserving the Worker's Vision

BY SANFORD DEHART
Director of Hospital and Employment Departments
The R. K. LeBlond Machine Tool Co.

Tendency of machinists to neglect their eyes—Why examination and correction are essential as well as economical — Effective magnets and anaesthetics

THE workman's eyes are his most valuable asset. A qualified machinist, with some executive ability, might get along very well without legs, or in a pinch without arms, but an employer would be very reluctant to employ a blind machinist. A deaf machinist could, and frequently does, do the work of a machinist very efficiently. As a matter of fact, a deaf machinist often makes a better showing on the efficiency chart than one who has not this infirmity, but a sightless machinist is up against it in a machine shop. The most remarkable part of all this is that the worker is thoroughly cognizant of the necessity of good vision, and yet there is no part of his anatomy that he so persistently neglects and abuses.

After reading some of the surveys made by competent eyesight conservation organizations, one would almost think that poor vision was compulsory in industry. The Eye Sight Conservation Council of America, New York, says that it is almost impossible to find a man or woman with perfect eyesight, after they reach the age of forty. An examination of more than 10,000 employees in factories and commercial houses showed that 53 per cent had uncorrected faulty vision, and 13 per cent had defects which were corrected, making a total of 66 per cent with defective eyes. The report of the Provost Marshal General to the Secretary of War on the first draft under the selective service in 1918, showed that 22 per cent of the causes for rejection were for visual defects. In Bulletin No. 71, of the United States Public Health Service, Washington, D. C., are given the results of an investigation into conditions in the garment industries of New York City. The visual acuity of 2,906 persons was tested and of this number only 743 had normal vision in both eyes. In 98 cases the vision was normal in one eye, but defective in the

FIG. 1—A SHOP WHERE DROP LIGHTS GAVE INADEQUATE ILLUMINATION

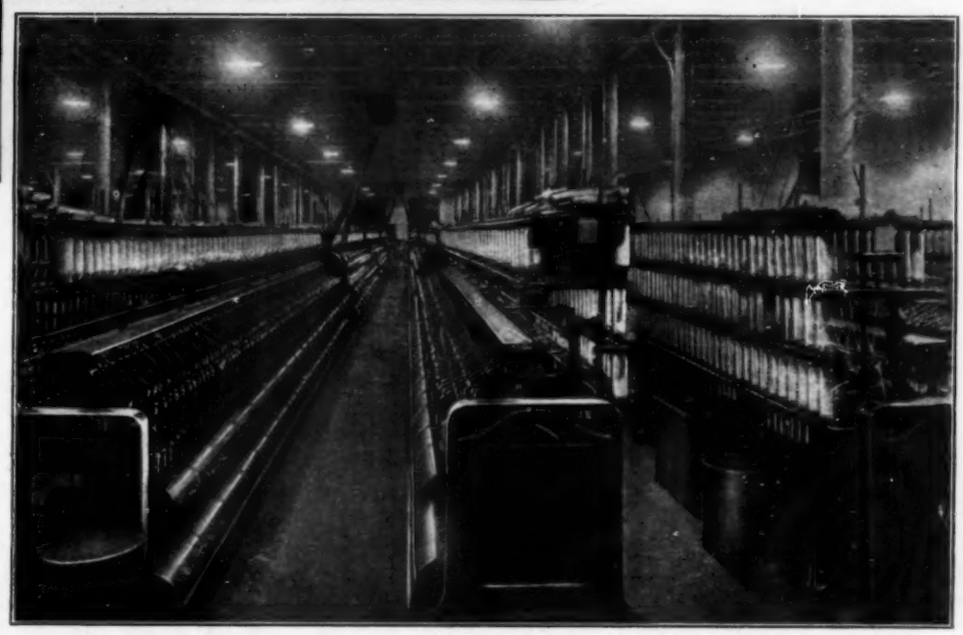


FIG. 2—THE SAME SHOP AFTER A BETTER LIGHTING SYSTEM WAS INSTALLED

Fig. 3—A man with two good eyes got work at the foundry as a chipper. The foreman, being on the job, obtains a pair of safety goggles and hands them to the man with two good eyes. Then he calls the man's attention to the rule about wearing the goggles.

other, while in 1,655 cases the vision of both eyes was defective. Of the 2,163 persons with defective vision 11 per cent wore glasses, and of these 20 per cent wore glasses which would wholly correct their visual defects. Out of the 2,800 cases of defective vision found by one examiner in an automobile factory, only 212 placed themselves under proper treatment.

After reading the report of the American Engineering Council, that eye accidents were the chief source of avoidable national waste in industry, an industrial manager in the Middle West conferred with his oculist and optician and arranged to pay for the examinations and supply glasses at cost where they were needed by the employees. The examinations of the employees in this plant showed that 20 per cent had absolute normal eyesight; 40 per cent had slight defects that did not warrant correcting lenses; the remainder were subject to eye strain or impaired vision necessitating glasses. The highest percentage of defective vision was in a class of workers who made the greatest use of their eyes. The examiner found that ten out of twelve workers employed in a department where good eyesight was of prime importance, could not properly see the work for which they were paid.

Where Vision Was Safety Factor

Recently while visiting a large steel plant, the chief surgeon related an illuminating incident to me which will serve to illustrate the importance of physical examinations in industry. A workman whose duties were confined to night work was employed there as a locomotive engineer. When physical examinations were instituted in the plant the engineer protested so vigorously against being examined that it aroused the suspicions of the examiner. When he was given the alternative of being examined or quitting he agreed to be examined. He was found to have badly defective vision in both eyes. Now, it is well-known that if good vision is at all necessary, it is of paramount importance to the locomotive engineer. When questioned as to how he guided his engine and kept out of difficulties, he said he was governed altogether by the shadows that were cast by the buildings and other stationary objects. He was subsequently referred to an oculist and his defect corrected. Today he is one of the greatest boosters for physical examination. So much importance do railroad executives place in the engineer having accurate vision that they will not permit him to wear bifocal lenses. He must have two sets of glasses, one for distance and one for reading, while on duty. The objection, of course, is to the dividing line in bifocal lenses.

It occasionally happens that one may have defective vision and not be consciously aware of it. A physician of my acquaintance told me that he did not know that

Fig. 4—Mr. "Know It All" with his two good eyes cannot see where there is any danger or reason for wearing the safety goggles, and so fastens them to his hat and starts merrily to work.

his own left eye was grossly defective, until he was called to examine men for the first draft under the selective service. However, he did not fare as well as the locomotive engineer referred to, for it was found that his eye was totally blind. From the foregoing it may be gathered that the examination of the employee's eyes is of great importance, especially where close or accurate work is required.

While most industrial managers appreciate the importance of acuteness of vision as one of the indispensable qualifications of the workers, very few have made any intelligent effort to ascertain whether the employee's vision is normal. It is fair to assume that the employer who manifests an interest in the employee to the extent of having the employee's eyes examined will also see to it that his workrooms are adequately illuminated. Unquestionably, one of the best investments that an employer can make is good factory lighting. Dividends from adequate illumination start from the very first day it is installed. Good illumination spells fewer accidents, less spoiled work and better eyesight.

Reliable statistics show that there is 39.5 per cent more stumbling and falling in shops during the winter months which are the dark months of the year. Good lighting at low cost can be enhanced by the addition of mirrored reflectors, and prism surfaced window-panes

instead of the ordinary window glass for windows. An example of the improvements made in one shop is shown in Figs. 1 and 2. Painting the factory walls white will do much to cut down the light bill. One factory manager considers $5,000 a year well spent for the systematic cleaning of the lighting fixtures and windows. Experience has taught him that this is an important factor in reducing the cost of illumination in his factory. The economic benefits accruing to both employer and employee in correcting faulty vision and the removal of foreign bodies from the eyes of the workers by competent persons, are matters not fantastic and nebulous and distant, but immediate and positive. I can best illustrate these benefits by citing the experience of a large machine tool builder in the Middle West. The company's plant is situated about eight miles from the nearest eye specialist. As much of its work is of an abrasive nature, in one year 35 per cent of the employees applied to the factory hospital of the concern for treatment for foreign bodies in the eyes. It had been the custom to send all eye cases in which the piece had become adherent to the eye ball to an eye specialist. During the year 1917, from this one cause alone, there were 861 hours lost or 107 working days, at a cost of $1,052. This amount included specialist's fees and state compensation, but did not include the amount lost to production.

In May, 1918, the company installed an eye room in its factory hospital, and was able to reduce its lost

Fig. 5—But very soon he is forcibly made to see the error of his ways.

time due to eye injuries to 436 hours for the year, and incidentally the cost to $412. A further reduction is shown in 1919 to 78 hours at a cost of $26. During the year 1920, for this cause, the lost time was 70 hours, costing $7.50. During 1921 there was no time lost due to eye injuries. The eye room was installed without any changes or additions to the hospital department.

The severity of the eye cases was greatly reduced due to the persistent education formulated by the medical attendant in the eye room. This education was supplemented by billboard propaganda and by stressing the importance of wearing goggles and of having the piece removed as soon as it enters the eye. Figs. 3 to 6 make up a good example of propaganda of this last type. Much of the success of the eye room was due to the excellent co-operation received from the foremen. Another factor which had an important bearing on the results obtained in eye work was that all the employees spoke English.

With reference to goggles, it is not an easy matter to get workers to always wear goggles when the eye is exposed to injury. A little tact tinctured with persistence will do much to overcome the employee's objections to wearing goggles. The American Steel Foundry adopted a type of goggles for chippers which reduced its eye injuries 80 per cent. An objection which is difficult to overcome is a man's repugnance to wearing another's goggles. One concern has largely overcome this objection by cleaning the goggles in a solution of mercury and alcohol in the employee's presence. Another serious objection to the use of goggles is that in hot places the goggles become clouded. However, there are several "anti-sweat" pencils that brighten the glass and prevent the clouded effect for several hours after each application.

Type of Lenses In Goggles

Goggles should be accessible to employees. For those who have defective vision, goggles with round glass should be furnished. Care should be exercised that lenses are not prismatic. It is comparatively easy to test lenses to ascertain whether they are prismatic or not. A very simple test will tell one the durability of lenses, for a durable lens is one that is properly heat treated.

At the LeBlond plant hospital we have found the electric magnet a very efficient device for the removal of steel from the eye. The Lancaster portable magnet is admirably suited for industrial eye work. It is suspended from a movable crane and attached to a wall plug. It is very flexible when supported in this way and can be pushed up when not in use. Another desirable feature of the magnet is that it does not require a rheostat. It is well to know that eye magnets are

Fig. 6—And now he is a member of the half-blind family. He thought he knew it all! If it were only he who had to suffer it would be enough, but he has a family.

wound to operate over direct current and will not function where alternating current is used, unless a rectifier is installed.

Industrial physicians are finding Butyn, a new local anaesthetic, a very valuable preparation in eye work. This drug possesses many advantages over cocaine, inasmuch as it is not affected by the Harrison Law and requires no narcotic blank. The anaesthesia produced by this preparation is more rapid than cocaine and is more lasting. It is also more efficient than cocaine, since it does not dilate the pupil nor dry the eye. Three drops of a two per cent solution of Butyn, instilled in the eye penetrates so well and so rapidly that superficially placed foreign bodies may be removed without discomfort within one minute.

In conclusion I wish to say, that the employer who manifests an interest in the employee to the extent of having his visual defects corrected is not only assisting the employee's eyes in functioning better, but is conserving the employee's nervous energy. It is almost inconceivable but true nevertheless, that approximately 35 per cent of one's nervous energy is normally utilized in one's visual organs. There is a close relation existing between the eye and the brain, in view of the fact that the optic nerves are portions of the lobes of the brain and the retina is the outgrowth of a rudimentary brain. Eye fatigue means a greater draining of nervous energy. The cost of correcting defective vision of employees is microscopic compared with the dividends derived.

Getting Men for the Machine Industry

By Herbert D. Harper

The report of the National Machine Tool Builders' Association and the resumé of it by your editorial on page 424, Vol. 58, of *American Machinist*, are good arguments for the existence and extension of vocational schools.

Although there are vocational schools in nearly all localities training boys for industry, they are not mentioned in your editorial, and in fact, they are rarely mentioned when a shortage of skilled labor is discussed. If they are referred to, it is always with the implication that the training received in a shop or factory is much better. From my experience as apprentice in a shop and as a teacher in vocational schools, I do not believe that fact is true, but on the contrary believe that the training received in the average vocational or trade school is far superior to that received in the average shop or factory.

Experiences of the Youth Entering the Shop

Social workers tell us that children seeking work look first in the locality in which they live. They have no way of telling the kind or quality of the work done unless by chance a friend happens to know, and they are as liable to pick out a shop where they do not teach all the trade as a shop where they do. They are told that they must start at the bottom, which is proper enough, but the bottom means assistant to a laborer and the boy learns to push a broom and run errands. Very little knowledge of his trade is obtained during the first few months or even longer. After he has started, the work is not laid out in any educational sequence and he is shifted from one job to another, not at regular stated intervals, but at the whim of the foreman. Even if he has bored and reamed a thousand collars he may have to do some more.

Then, how many foremen are qualified to teach? Certainly the average foreman is not qualified because of his lack of technical knowledge. He holds his job because he can do a process a little quicker or better than the average, but knowing how is quite different from teaching how as a good many foremen have found out. Some large firms do employ a technical man to teach apprentices and have good apprentice systems, but the majority of small firms do not and they far outnumber the large ones. And in those large concerns that depend on the foreman for instructions, the same limitation controls—the lack of technical knowledge.

The Training In the Average Vocational School

How far superior is the training in the average vocational school? In the first place, the shop teacher has qualified for his position by passing a written, practical and oral test. To qualify for the examination he must be an all-round journeyman, with at least five years' experience, and a high school education or its equivalent. In the second place, the work is arranged in an educational sequence and each step is explained and the reason for it given in shop talks and demonstrations.

Together with the graded shop work the student receives a good academic training based on his shop work. He is taught how to draw and how to figure his job. He is taught English, both oral and written. In the science class, he learns the purpose, use and structure of his work, with any chemistry connected with its making. The history of his trade is taught that he may have some appreciation of the struggles of the early artisans to advance the science of invention and manufacturing. He also learns the history of his government and the duties of a citizen, for if the government is to endure, it is just as important for an apprentice to be a good citizen as a good mechanic. Labor unrest and disturbances are in a great many instances due to a lack of understanding of our institutions. Certainly the combined related and trade work makes a better citizen and artisan, for he has been taught not only how to make a living but how to live. He will make a better balanced man, one who will not be led astray by demagogues or agitators because in the light of his knowledge he can analyze their fallacies.

The Employer's Interest in Training

If the above facts are true, and I believe them to be true, should not employers everywhere take a larger interest in vocational schools? The interest might be taken from the smaller viewpoint of self-interest, even if the larger viewpoint of citizenship is not considered. For the added taxes are but a small per cent of the cost of maintaining an adequate apprentice department, and the schools also decrease his overhead expense by weeding out the incompetent and unfit. There are several ways in which interest could be shown by employers, namely: they could see personally or through their Chambers of Commerce that their local School Boards appropriate sufficient funds for the proper teaching of trades; they could find out if the work being done is of high enough grade to obtain State and Federal aid, and they could give models and parts for drawing and sketching, and could arrange for Saturday morning visits for the boys working in their particular trade.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The eleventh article — Calculation and distribution of payroll — Systems of rating piecework — Recording the time elapsed on a job — Arrangement of payroll

THERE IS PROBABLY no single subject in the whole industrial world that is of more universal interest than that of wages. To the worker it means his living; to the manager, the difference often between profit and loss in the operation of his business; to the public it frequently means inconvenience and loss when the first two parties fail to agree and the public is forced to shoulder the loss in one form or another. The cost accountant as such is not interested in any of these phases of the problem for they do not come under his control, nor is he responsible for them. He is concerned with the necessary records which must be prepared for the sum which the workers earn and for their allocation to the accounts which represent the resulting benefits. Hence, important and interesting as the economic and social phases of this problem are, we shall confine our attention simply to the cost accounting phases of the question.

Calculation and Recording of Salaries

Before wages and salaries can be recorded and distributed it is necessary that they be calculated. In the case of what are commonly called salaries—those payments for services which are paid on a monthly, quarterly or yearly basis—the calculation is not usually very difficult. A simple division will give the amount of the monthly salary check if it is not already expressed in terms of a month, and recording these salaries is equally simple. A single salaries account which is to be debited and credited each month with the amount paid out in salaries, itemized by individuals, should be quite sufficient. The corresponding credits and debits are made to cash through the voucher register and the accounts payable account and to the appropriate expense accounts which are for the purpose of recording the benefits conferred. Usually a simple memorandum form of payroll book will be kept in which these transactions are journalized, though it is quite possible to use the general journal for them in the case of a small concern.

The only real problem which arises in connection with the cost accounting for salaries is the question of their distribution in certain cases. If the individual devotes his entire time to the work of a single department then it is evident that his entire salary should be charged to some appropriate expense account for that department. (The matter of the detailed expense accounts will be discussed at some length in the following articles.) If, however, he works in two departments, dividing his time among them, the salary division can be made in the same ratio. But if the individual passes in rapid succession from the duties of one function to those of another, then it is not so easy to divide his salary on a time basis and an arbitrary separation is sometimes necessary. Once the decision is made, how-

Form No. 1165
PAY ENDING April 15 1916

No. 61

NAME J. K. Hill

	MORNING IN	NOON OUT	NOON IN	NIGHT OUT	EXTRA IN	EXTRA OUT	
1	6 44	12 02	12 55	5 04			9
2	6 58	12 01	12 57	5 02			9
3	7 26	11 59	12 46	5 03	6 00	9 00	11½
4	6 51	12 00	12 54			6 02	10
5	7 00	12 03	12 59	5 03			9
7	7 02	12 04	12 58	5 05			8 3/4
8	8 01	12 10	1 01	4 30			7½
9	6 50	11 58	12 53	5 04			8 3/4
10	6 44	12 03	12 52	5 15			9
11	6 51	12 04	12 55	5 03	6 00	8 01	11
12	6 47	12 04	12 58	4 59	6 02	10 00	12 3/4
13	7 28	11 30					4
14	6 58	12 04	1 00	5 03			9
15	7 00	12 05	12 59	5 06			9

TOTAL TIME 127 3/4

RATE 28

TOTAL WAGES $ 35.77

Courtesy of the International Time Recording Co.

FIG. 31—TIME CARD SHOWING RECORD FOR ONE PERSON'S TIME FOR ONE-HALF A MONTH

For the author's forthcoming book. All rights reserved.

ever, its application in the records presents no difficulties whatever.

Since most individuals in a manufacturing concern who are paid on a salary basis are remunerated on the basis of what they accomplish and not on whether or not they spend so many hours each week at the plant, there are no deductions to be made for absences, unless

TIME TICKET

JOB NO 493 MAN'S NO 78

JUN 15 PM 4 .3 STOP MAN'S NAME A. Larson

JUN 15 PM 1 .1 3 2 START RATE .40 AMT. 1.28

DESCRIPTION OF WORK Assembling

NAME OF PIECE Date Wheel DR'W'G NO 87

SHOP CLERK'S O. K. MLS FOREMAN JWM

Courtesy of the Stromberg Electric Co.

FIG. 32—ONE METHOD OF RECORDING TIME STARTED AND TIME FINISHED FOR A JOB

of long duration, nor for irregularities. In fact, it is not usually customary to make any record of the time of arrival or departure of such persons.

When we consider the remuneration of those workers who are paid on an hourly or weekly basis, or according to their output when at the plant, we find that we are confronting quite a different problem. While it is true that in the continuous process type of industry and for some of the departments in almost all companies the employees are engaged steadily in one task throughout the day, it is also true that for the intermittent and jobbing type of industry there are usually more or less frequent changes in the jobs which the men are working on. These changes mean, of course, that many calculations must be made if the labor cost is to be distributed to the various orders on which the work is accomplished.

Incentive Methods of Wage Payment

Nor is this the only problem which must be faced in that connection. In recent years the effort has been made to provide a more definite incentive to the workers to turn out satisfactory work rapidly by paying them certain bonuses or premiums if they perform their tasks up to certain quality and quantity standards. Unquestionably it is a desirable method if the premiums are set on standards which have been established on the basis of careful time studies and the conditions of factory operation have been brought under control. The results under such conditions when looked at from the standpoint of the manager are likely to be better work, more work and more satisfactorily controlled work. On the other hand it must not be forgotten that there are certain costs which offset to some extent the gains which might otherwise be obtained.

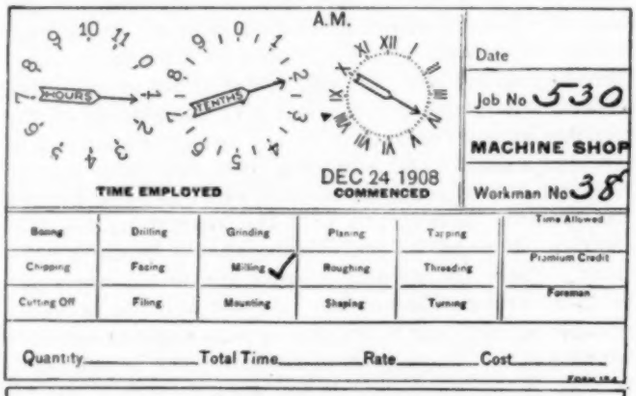
The costs which are involved in the setting of the manufacturing standards referred to above, are usually fully appreciated by those who are responsible for the decision in this matter. The costs of operation of any of the incentive methods of wage payment are all too frequently overlooked, however. They are often considerable and as they are continuous, their importance must not be minimized. Since the cost accountant is usually the one to whom the duty falls of making up the payroll, he has a very vital interest in this matter, if not from the point of view of cost primarily, certainly from the standpoint of the amount of labor involved.

As a basis for comparing the labor involved in the calculation of wages by the newer incentive methods of wage payment, let us first consider the older methods of day work and piece rate methods. The first of these is not in any sense an incentive method, but is based wholly on the amount of time which the worker spends at the plant and presumably on some job. Its calculation is the height of simplicity. The worker is given a certain wage rate per hour and the amount of time spent at the factory multiplied by this rate gives his earnings for the period, and the amount of time spent on any order extended by the same rate gives the labor charge to the order.

The Piece Rate Method of Wage Payment

The piece rate, which is one of the best incentive methods of wage payment known, is equally simple, though it is developed on an entirely different principle. A certain rate per piece or unit of product is set and the worker is paid at that rate for all satisfactory units which he completes regardless of the amount of time he takes to do them. (It should be strongly emphasized that the rate should be set only on the basis of carefully developed standards and not by guesswork, as is so often the case.) The calculation then is simply the extension of the number of accepted units of product by the rate per unit. It is, of course, necessary to obtain a report on the production of the worker in the form of an inspection report before the wage can be determined.

Let us now compare these calculations with a few examples of the more modern type of incentive methods of wage payment. The Halsey Premium System was one of the earlier of these methods and has frequently



Calculagraph Elapsed Time Record. Starting Time for Job 530—8:20 a. m. Elapsed Time, 1.2 hrs.

The Calculagraph prints Elapsed Time on cards furnished by any printer.

Courtesy of the Calculagraph Co.

FIG. 33—AUTOMATIC CALCULATION OF TIME ELAPSED IN DOING A JOB

been used quite successfully. The data which are needed are: (1) time actually worked, (2) quantity of satisfactory output, (3) standard time allowed, (4) employee's rate per hour, (5) rate of premium.

The actual calculation involves the following steps: (1) Compare standard time allowed with time actually taken. If the time taken is greater than that allowed,

THE MEASUREGRAPH COMPANY

FACTORY PAY ROLL Week Ending ..... 192....

Workman's Clock Number	NAME	Basis of Pay	DAYS Mon	Tues	Wed	Thurs	Fri	Sat	Gross Amount	Deductions For	Deductions Amount	Net Amount	✓	Check Number
		Hourly												
		Piece Work												
		Bonus												
		Total												
		Hourly												
		Piece Work												
		Piece Work												
		Bonus												
		Total												
TOTAL														

FIG. 34—GENERAL PAYROLL *Courtesy of the Measuregraph Co.*

the calculation is the same as for the ordinary day rate method. (2) If the time taken is less, then the amount of time saved must be found. (3) The premium is calculated by multiplying the time saved by the rate of premium and then by the worker's rate. (4) The premium is then added to the amount of his regular wages which is found by the day rate method. There is nothing very difficult about this computation. Once the formula is established a grammar school child should be able to apply it. It is evident, however, that if the calculation must be made many times for a day, the cost will be not a little more than that for either of the other methods.

The Gantt Bonus Method

Lest the method be thought an isolated case, let us now consider the Gantt Bonus Method of wage payment. The method has earned much deserved popularity and yet it involves not a little labor in its calculation. The data needed are: (1) time actually worked, (2) quantity of satisfactory output, (3) the standard time allowed, (4) the employee's rate per hour, (5) the bonus rate, (6) the bonus time. The information is about the same information as that required for the operation of the Halsey Premium System, though it is utilized in a somewhat different fashion.

The various steps in the computation are as follows: (1) Compare the time allowed with the time actually taken, if the time taken is greater than the time allowed, the calculation is the same as for the ordinary day rate. (2) If the time taken is less, then the bonus time is multiplied by the bonus rate which is then multiplied by the employee's rate. (3) The amount is then added to his regular wage found by multiplying his rate per hour by the number of hours which he has taken. It may be seen that the calculation is possibly a little simpler than in the preceding case, but it is still much more complicated than for the piece rate or day rate methods.

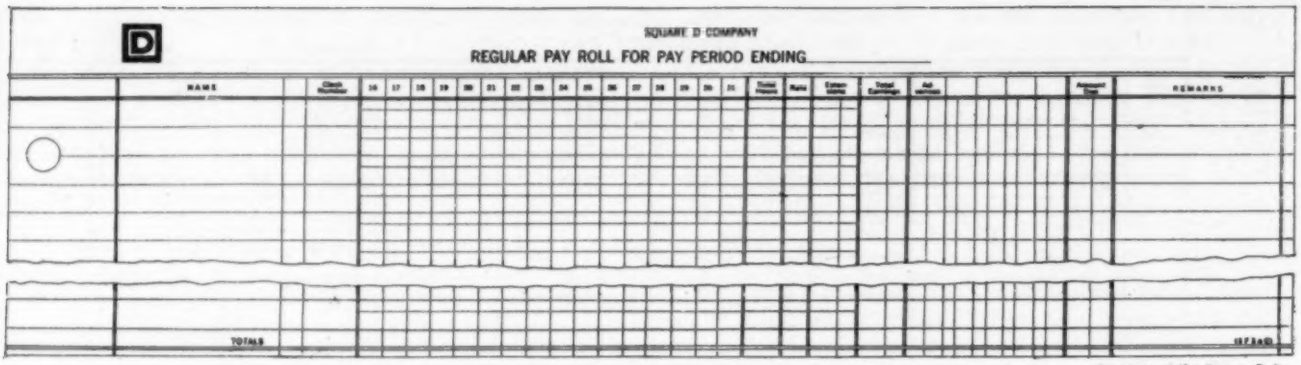
One more illustration will be given before leaving the question of wage calculation. The Emerson Efficiency System differs much more from the two preceding

Bonus-Premium Pay Roll For Pay Period Ending_____

	BONUS EARNED		BONUS UNEARNED		BONUS EARNED		BONUS UNEARNED		BONUS EARNED		BONUS UNEARNED		BONUS EARNED		BONUS UNEARNED		BONUS EARNED		BONUS UNEARNED	
Name																				
Clock Number																				
DATE	Hours Earned	Time Taken	Time Taken	Std. Time	Hours Earned	Time Taken	Time Taken	Std. Time	Hours Earned	Time Taken	Time Taken	Std. Time	Hours Earned	Time Taken	Time Taken	Std. Time	Hours Earned	Time Taken	Time Taken	Std. Time
TOTALS																				
4 Times Hours Earned																				
Time Taken & Std. Time																				
Time Saved & Premium																				
Total Bonus Hours																				
Total Premium Hours																				
Total Hours Earned, Rate Per Hour, & Amt Earned																				

SF1-5-AC

FIG. 35—BONUS-PREMIUM PAYROLL *Courtesy of the Square D Co.*



Courtesy of the Square D Co.

FIG. 36—REGULAR PAYROLL AFTER BONUS PAYROLL HAS BEEN TAKEN OUT

methods than they do from each other. The first step in the development of the method is to prepare an efficiency bonus scale. According to the scale, which can be laid out in an arbitrary fashion, when the worker attains a certain efficiency percentage, he will receive a certain bonus payment.

The next step is to ascertain what shall be treated as one hundred per cent for each and every task. In addition to these two elements, it is also necessary to know, before the wage calculation can be made, (1) the time actually taken, (2) the quantity of satisfactory output, and (3) the employee's wage rate. The calculation is: (1) Find the ratio of the worker's rate of output to the standard rate of output. If the ratio is not high enough to reach the efficiency scale then only the ordinary day wage is paid. (2) If the ratio reaches the scale, then the bonus rate corresponding to the efficiency attained is selected. (3) The bonus rate is applied to the ordinary day wage calculated in the usual fashion. (4) The premium and day wage are added together. Without much question the last method involves more calculation than either of the others.

Similar illustrations could be given for other incentive methods of wage payment such as the Rowan Premium System or the Taylor Differential Piece Rate. Enough has been presented, however, to show that the cost of calculation is an element which must be considered in the selection of an incentive method of wage payment. It must not be inferred that the writer is opposed to the employment of these methods of wage payment. He has had not a little experience with several of them and he believes thoroughly in their value to a company. Their advantages often much more than offset any costs which they may involve over and above those of the simpler methods. The cost of their calculation needs to be considered in deciding which method to select and not infrequently will be a deciding factor in the final selection.

Time Recording by Day and Piece

One of the most important elements in the recording of the payroll and the allocation of labor costs and earned burden is the recording of the time of the workers. Even though the workers are paid by a piece rate it is necessary to collect the time for each order in most cases in order to be able to apportion the earned burden to it. In general, there are two methods of timekeeping in use at present.

One of these methods is to record the overall time which the workers spend at the factory and to use it to check the distribution of the time to the several orders or expense accounts. The way in which such a record is made is customarily by means of a clock card which the employee inserts in a special clock each time he enters or leaves the plant, and by pressing a lever records the time thereon. An excellent illustration of the card is shown in Fig. 31. The other method is to record only the time for each job and to sum these up to find out how much time during the day each worker has spent at the plant.

Method of Recording Time on Job

There are several ways in which the time for each job worked on may be obtained. Neither having the men record their own time nor sending a time clerk around occasionally for this purpose is a very satisfactory solution for this problem. A much better way is to stamp the time at which a job starts on the card which directs the worker to perform the task and then enter the time when the lot is finished, using an automatic clock devised for this purpose. One method which has given satisfaction under many conditions is that illustrated in Fig. 32. The time started and the time finished are both stamped on the time ticket, and the elapsed time is found by subtraction.

Another method which has proved very workable under a wide variety of conditions is that shown in Fig. 33. Here the time started is recorded, and the time actually taken is automatically calculated at the end of the job by putting the card again in the clock and pulling the proper lever. In these ways the total time spent at the factory and on each job can be obtained with a considerable degree of accuracy, an accuracy fully as great as the calculations upon which they are dependent.

When the time has been recorded, the next task is to put in permanent form the amount which the company owes the worker, and to do it in such a way that controlling entries to the various accounts which are affected by labor costs may also be obtained therefrom. Under some conditions the plan is relatively simple. When the workers are engaged on the same *class* of work continuously, even though the jobs within that class change frequently, the design of a payroll book is not difficult. The total of every man's wage within a department whether he is paid by the day work method or by the piece rate, whether or not he has an opportunity to earn a bonus will then all be charged to one controlling account. So a simple form like that shown in Fig. 34 will be all that is needed.

When it happens that the worker may work part of the time on worked material, part on merchandise and part on maintenance work, for example, then it becomes necessary to so arrange the payroll as to permit the

segregation of the time spent on these different classes of orders. It is also necessary, if overtime work comes with any frequency, to provide for a special record of that for it is usually paid for at a higher rate than the regular time. It is also necessary to face another problem. When bonus or premium is paid it is essential that the work be inspected before the bonus is calculated which often means a slight delay which would interfere seriously with getting the payroll made up quickly after the close of the pay period.

The Bonus and Regular Payrolls

The last problem is often solved by taking the bonus payroll out of the general payroll, setting it up by itself in some such manner as is illustrated in Fig. 35. The bonus can then be paid at a later date than the regular payroll which in this way can be greatly expedited. The regular payroll can be arranged in the manner shown in Fig. 36. As many horizontal lines may be taken for each worker as may be needed and the unmarked columns at the right provide a means for accumulating the various classes of charges in any fashion which may be most convenient for a particular department. These payroll forms are the ones most commonly used.

Occasionally it will be found desirable to have certain special payroll forms for particular needs. Fig. 37 is an illustration of this kind of thing. Some concerns have all employees engaged in working on the product grouped together under sub-foremen and instructors whose duty it is to aid, instruct and guide the workers as much as possible. It is not desirable to have them drive the workers and so it is better to pay them a bonus according to the *percentage* of bonus hours worked which are earned and not according to the amount of the earnings of the employees under them. Hence, a rather out-of-the-ordinary payroll is required to meet the peculiar needs.

The Payroll Book as a Journal

The first function of the payroll is to serve as a register of the indebtedness of the company to its employees. The accumulation of the time each has spent at the plant and his premium or bonus earnings can easily be obtained from the entries on the forms illustrated in the various figures. Its second function is to serve as what is essentially a journal, and it has been explained how the various classes of entries are kept separate. It is necessary, however, to prepare the entries for the general ledger accounts. This preparation is usually accomplished by means of a summary at the close of each payroll period on the last payroll sheet or, perhaps, better on a special sheet for that purpose. Its arrangement should be something as follows:

Merchandise in Process
Worked Material in Process
Improvements in Process
Administration Expense
Auxiliary Manufacturing Expense
Direct Manufacturing Expense
Selling Expense
Miscellaneous (itemized)
Payroll

In general appearance it is very much like a general journal entry which, fundamentally, it is. The summary is made at the close of each pay period and also at the end of each accounting period if the two do not coincide. It is necessary to follow such a plan in order that the proper charges may be made for the period to the various accounts and also that the accrued payroll may be shown as a liability. The accrued payroll is, of course, the amount of pay which the employees have earned but which has not yet been paid them because the pay day has not yet come. The payroll account appears as follows:

PAYROLL ACCOUNT

Voucher Register (amount paid employees for services rendered during the period stated on the voucher. Credit therefore to the accounts payable account).*	Payroll Book (amount earned by employees by services rendered during the period stated therein. Debit therefore to in process, expense and miscellaneous accounts).

*The amount paid employees is, of course, at once paid and at the end of the accounting period the accounts payable account is debited and the cash account credited for this amount as a part of the totals posted to these two accounts.

The distribution of the labor costs to the detailed records is not difficult in theory and is explained in detail in the articles dealing with the recording of expenses and product and improvement costs. In brief, the method is this: Each time-ticket should have recorded thereon the symbol of the account or order to which it is to be charged. After being entered in the payroll book the time-tickets are then sorted according to the symbol and later totaled to give the labor cost allocatable to the order or account in question. If there are employees on the payroll who do not ordinarily have time-tickets like foremen, it is usually convenient to make out one time-ticket (or more, if their time is apportioned to more than one account) for their time for the period in question. This method facilitates sorting and checking by having time-tickets to account for every moment of time recorded in the payroll record.

The proper recording of labor costs is essential to good cost accounting because the satisfactory allocation of the earned burden is often dependent upon them.

THE ACME WIRE CO.

DEPARTMENT No. INSTRUCTORS BONUS RECORD

	FOR WEEK ENDING	BONUS HOURS EARNED	BONUS HOURS LOST	PER CENT BONUS HOURS EARNED TO TOTAL EARNED & LOST		BONUS HOURS EARNED	BONUS HOURS LOST	PER CENT BONUS HOURS EARNED TO TOTAL EARNED & LOST		BONUS HOURS EARNED	BONUS HOURS LOST	PER CENT BONUS HOURS EARNED TO TOTAL EARNED & LOST		BONUS HOURS EARNED	BONUS HOURS LOST	PER CENT BONUS HOURS EARNED TO TOTAL EARNED & LOST		BONUS HOURS EARNED	BONUS HOURS LOST	PER CENT BONUS HOURS EARNED TO TOTAL EARNED & LOST	

FIG. 37—SPECIAL PAYROLL FOR INSTRUCTOR'S BONUS RECORD *Courtesy of the Acme Wire Co.*

Methods of Machine Tool Design —Discussion

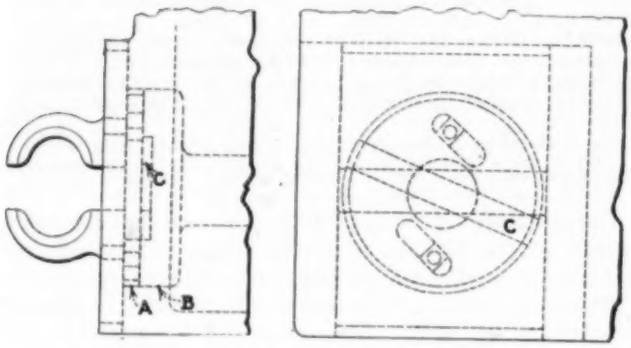
BY ALBERT CLEGG
Yorkshire, England

Under the above title on page 563, Vol. 57, of the *American Machinist*, A. L. De Leeuw discusses the design of half-nuts for use in connection with the lead screws of lathes.

It is recognized frankly in the article in question that there is some difficulty in insuring that both halves of the nuts bear equally on the threads of the lead screw, the statement being made that it will invariably be the case that one half is practically clear of the screw and the other half does all the work.

A DOUBTFUL EXPEDIENT

There are some British makers who overcome this defect by the doubtful expedient of only fitting one-half of the nut and making up for the lack of bearing surface by increasing the length. The screw is, of course, supported by half bearings on the under side at frequent intervals. Apart from the fact that there is a



EQUALIZING DEVICE FOR LEAD-SCREW NUTS

bending stress imposed on the screw, which varies somewhat according to the distance from a support, the idea does actually insure that a full bearing will be maintained and that the whole area of the nut will be effective.

To overcome the defects of the orthodox arrangement of lead-screw nuts, the writer has used an equalizing device, shown in the accompanying sketch, which practically insures that both halves of the nut will bear equally on the screw. The cam-plate is in two pieces, *A* and *B*, the two being loosely connected by a tongue and groove, *C*, so that the cam-plate proper may slide somewhat across the face of *B*. This arrangement insures that the two cam slots shall be in intimate and equal contact with their pins before the halves of the nut can be moved. There will be a slight tendency for the upper half to bear the heavier on the screw, due to the action of gravity which tends to increase the pressure on the upper half and correspondingly decrease the pressure on the thread of the lower half. To overcome this defect, it would be necessary to have the nut opening horizontally instead of vertically, an arrangement which would be rather uncommon but by no means unique, as there are several makers who adopt this principle. It is, however, open to the objection that it tends to increase the distance the lead screw projects from the side of the bed. As a matter of fact, Messrs. Lang, of Johnstone, Scotland, have adopted this idea of the horizontally sliding nut in their latest designs of lathes.

Two other details of lead-screw nuts, which, though relatively insignificant, are still sufficiently important to merit the small amount of attention and extra work required to make them more mechanical and durable than they are at the present time. The items referred to are the cam slots and the pins which slide in them. In the first place, the pins should be fixed in the half-nut and not in the cam-plate. By so doing the pins can be fixed in the center of the slide of the nut and will always be in this position, whereas when the pins are fixed in the cam-plate—as shown in Mr. De Leeuw's Fig. 164—they become, in effect, cranks, and are open to the objection that during some portion of their action they are tending to tilt the halves of this nut in the slides due to their being out of center. When the alternative arrangement is used, the pins are always central, and consequently, are always exerting a direct, central thrust on the nut. Another of the points to which exception is taken is the shape of the pins. This is usually cylindrical, with the result that the pins (since they slide in straight or large radius slots) have only line contacts, and consequently will quickly develop more or less pronounced flats. With the usual style of cam slots this is inevitable as it is practically impossible to have surface contact on a surface which is a compound curve, i.e., a curve which is neither an arc of a circle nor a straight line. For this reason, the writer's practice is to make the cam slots straight, as shown in sketch, and make the pins with square or rectangular heads to fit. The cylindrical portions of the pins are a running fit in the nut so that they may turn slightly to accommodate the varying angles of the cam. This arrangement also facilitates the manufacture, as it is a simple matter to machine the cam slots from the solid on a keyseating machine of the end-mill type, the whole operation only taking three or four minutes with a suitable fixture.

The action of the straight slots is a harmonic one, the greatest leverage being obtained when the halves of the nut are closed. This is an advantage as it insures that the nut will be self-locking and it also means that a greater leverage is available for disengagement. Exactly similar results, so far as surface contact and increasing leverage are concerned, can be obtained with slots which are curved to an arc of a circle, but the machining is a little more complicated and will probably consume slightly more time.

Data on Pure Iron Alloys

The Department of Commerce has issued scientific paper of the Bureau of Standards No. 464 dealing with the preparation and properties of pure iron alloys. This paper is No. 3 and treats particularly of the effect of manganese on the structure of alloys of the iron-carbon system. The authors are Henry S. Rawdon and Frederick Sillers. Copies may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at ten cents per copy.

Additional value is found in the three tables that are contained in the booklet. The effect of manganese on the tensile properties of commercial carbon steel, normalizing treatment, and the effect of manganese on the Brinell hardness of the annealed alloys are tabulated and make excellent reference data. Many photographs showing various effects obtained illustrate the text.

Machining Blades for Steam Turbines

By FRED H. COLVIN
Editor, *American Machinist*

Important operations handled by both internal and external grinding—Drilling and milling operations—How the blades are assembled

THE CONSTRUCTION of steam turbines has changed greatly, and instead of bronze blades which originally prevailed, these important elements are now made from a 3½ per cent nickel alloy-steel. There are some 25 operations involved, as shown in outline on the operation sheet, Fig. 10. All of these operations do not apply to the blades illustrated in half tone but the sheet gives a good idea of the general procedure.

One of the first major operations is cutting the inside radius of the blades. In operation two blades are cut at the same time, being held apart the correct distance so as to give the desired radius on each blade. The tool used is known as a "rosebud" drill, being distantly related to the old rose reamer which was formerly popular in some kinds of work.

One method of performing this drilling operation is shown in Fig. 1, where two large blades are being bored on a Newton horizontal boring machine. This shows the type of tool used and shows how the blades are held.

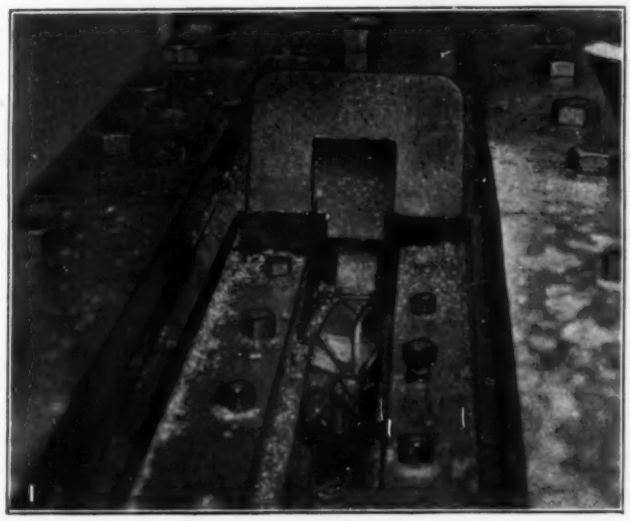
An Unusual Milling Operation

A very unusual milling operation is shown in Fig. 2. The blade to be milled is held at each end by separate cam-operated clamps, *A*. The two horizontal spindles B, carry gangs of cutters which mill the cross slots, forming the tongue which fits into the groove of the rotor. At the same time, the cutters on the vertical spindle *C*, mill a tenon on the outer end of the blade, and face the outer end to the correct length with relation to the slots cut by the horizontal cutters. The work is done on a Newton special milling machine with spindles arranged for this particular job. A finished blade is shown at *D*, the tenon being at the left and the slots at the right.

Some of the internal grinding operations are particularly interesting, principally owing to the fixtures used in holding the blades. Figs. 3 and 4 show similar operations, the principal difference being in the size of the blade being ground. The smaller blades are ground in the Bryant machine shown in Fig. 3. The blades are held in pairs, as at *A*, the back ends fitting into the clip *B*, which locates and spaces them inside the grinding sleeve. With the clip in place the sleeve *C*, is placed over the mandrel *D*, which is supported by the stand on the bench shown. The two blades are then pushed down around the mandrel and inside the sleeve until the clip *B* fits into suitable slots in the end of the sleeve.

Details of a chuck for one of the shorter blades are shown in Fig. 5. The outer bearing surfaces of the sleeve are tapered about 10 deg. and there are four bayonet-joint cams which force the sleeve back on the tapered surfaces and lock it firmly in position. A pin wrench in suitable holes in the outer end of the sleeve makes it easy to lock it in place or to remove it. Two chucks are provided so that one can be loaded while the other is at work.

A very similar operation on a larger size blade is



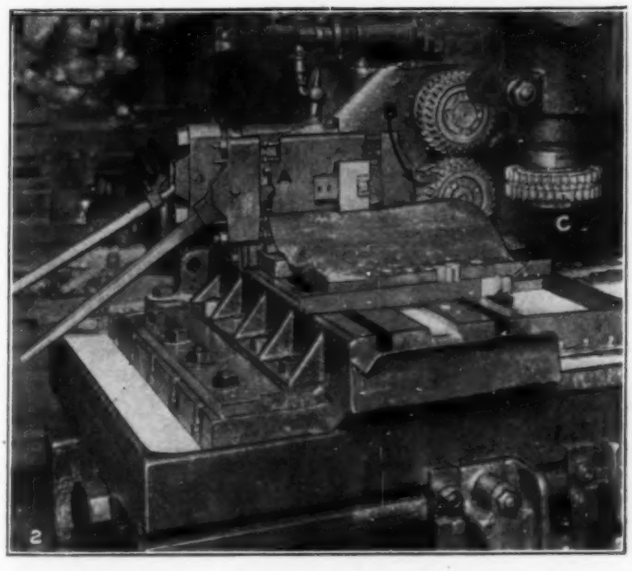
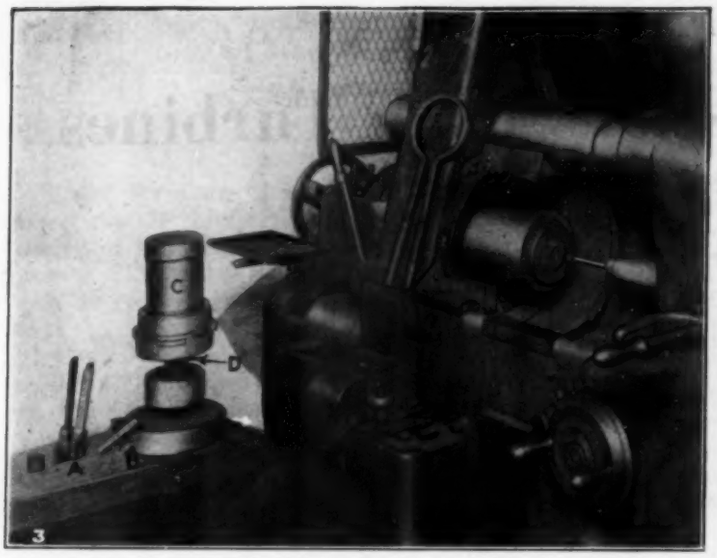


FIG. 1—HORIZONTAL DRILLING OF TWO LARGER BLADES.
FIG. 2—MILLING BOTH ENDS OF BLADES



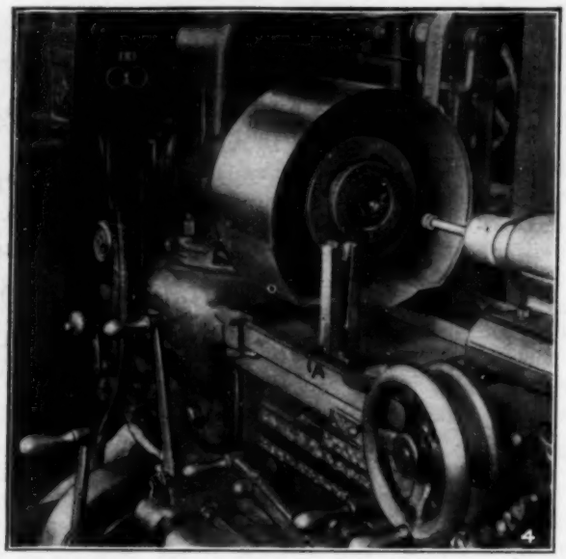


FIG. 3—GRINDING INSIDE OF SMALL BLADES. FIG. 4—GR NDING LARGER BLADES

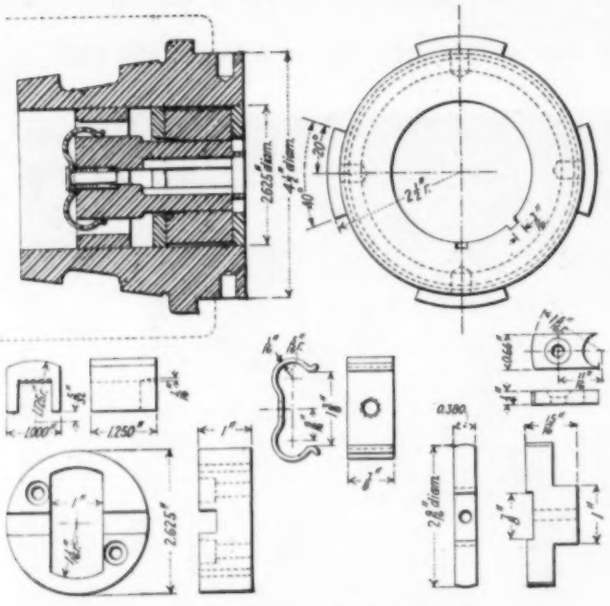
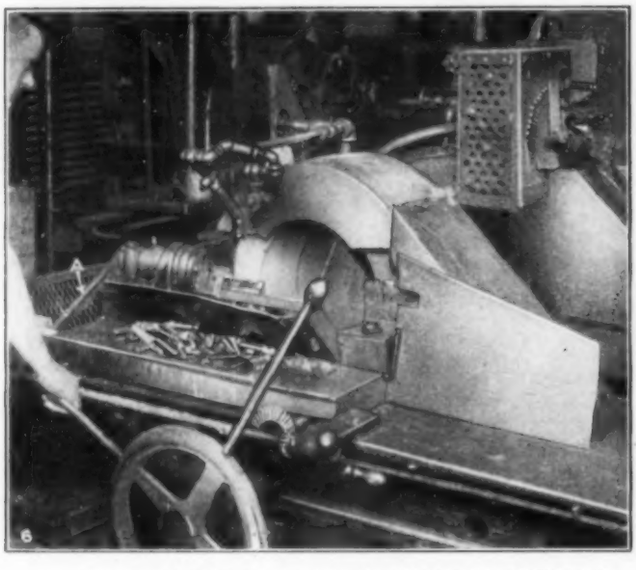


FIG. 5—DETAILS OF CHUCK

shown in Fig. 4, where the work is being done on a Heald internal grinding machine. The method of holding the two blades is very similar to that shown before as may be seen in the foreground at *A*, and the chuck itself is of much the same construction as the one shown in Fig. 5. The operation is somewhat ticklish, as the ground part of the blade is 10 in. long and only 1.3 in. in diameter. The output is approximately 24 blades per hour. The wheel used is about 1½ in. in diameter by ¾ in. face, the grade being 38-60 P. The stock removed is from 0.005 to 0.007 inch.

After the backs of the blades are milled they are finished by grinding on different types of machines. How small blades are ground on a Diamond ring-grinding machine is shown in Fig. 6. The blades are held in a special fixture which enables the operator to grind them to the proper angles on the sides, and to rotate them so as to secure the desired radius on the back. This rotation is secured by the lever *A*, while the pilot wheel in front controls the in-and-out feed of the wheel.

Another outside grinding operation is shown in Fig. 7, the blades being very large and having a different type of dovetail for holding them on the rotor. Two



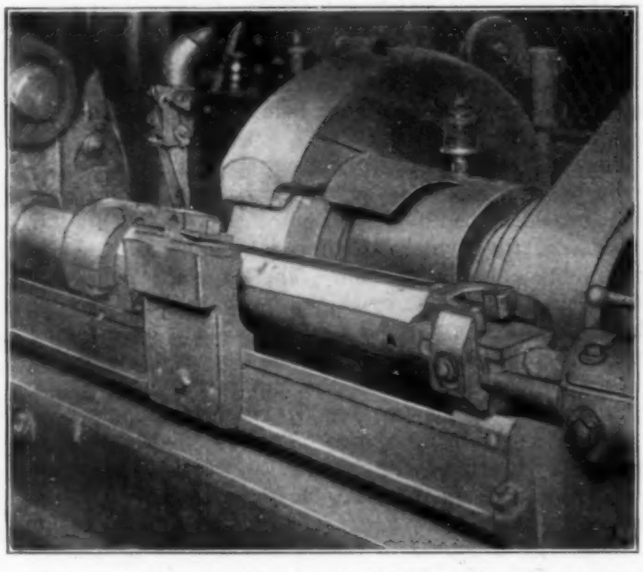


FIG. 6—GRINDING BACKS OF SMALL BLADES. FIG. 7—USING CAM GRINDING MACHINE FOR LONGER BLADES

blades are clamped to a special mandrel, *A*, and are then placed in a Norton 14-in. cam-grinding machine which secures the proper oscillation automatically from suitable master cams on the machine. An aloxite wheel, No. 36-24 J is used.

An unusual grinding operation is shown in Fig. 8, where a specially constructed belt machine is used in

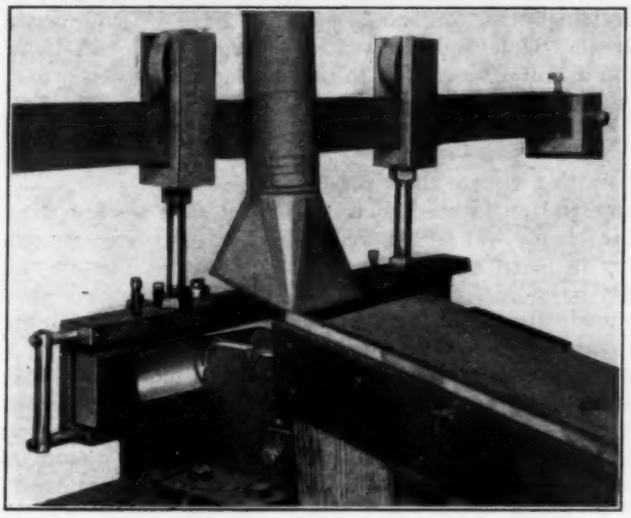


FIG. 8—BELT GRINDER FOR LARGE BLADES

grinding the insides of very large blades. The outer or guiding wheel is of the correct diameter to fit the blade being ground. The blade is supported in the frame shown, the frame being suspended from a substantial rail on which it is moved back and forth by the handle at the left. The machine can be easily adapted for

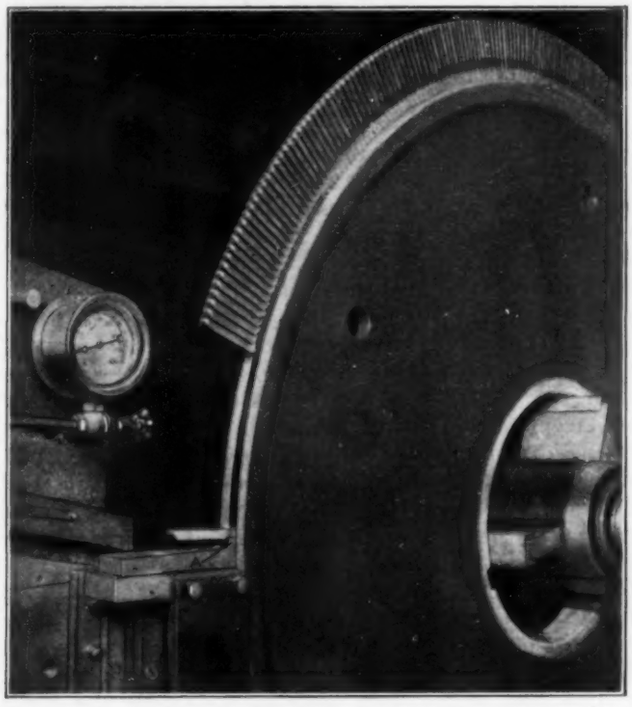


FIG. 9—ASSEMBLING BUCKETS ON ROTOR

various blades by changing the outer roller for one of the proper diameter. The grinding belt is approximately 16 ft. long.

The method of assembling the blades in the rotor is shown in Fig. 9. A notch is cut at one point in which the blades are inserted. The blade is held against the rest at *A* and the rotor slowly revolved until the other blades are brought against it.

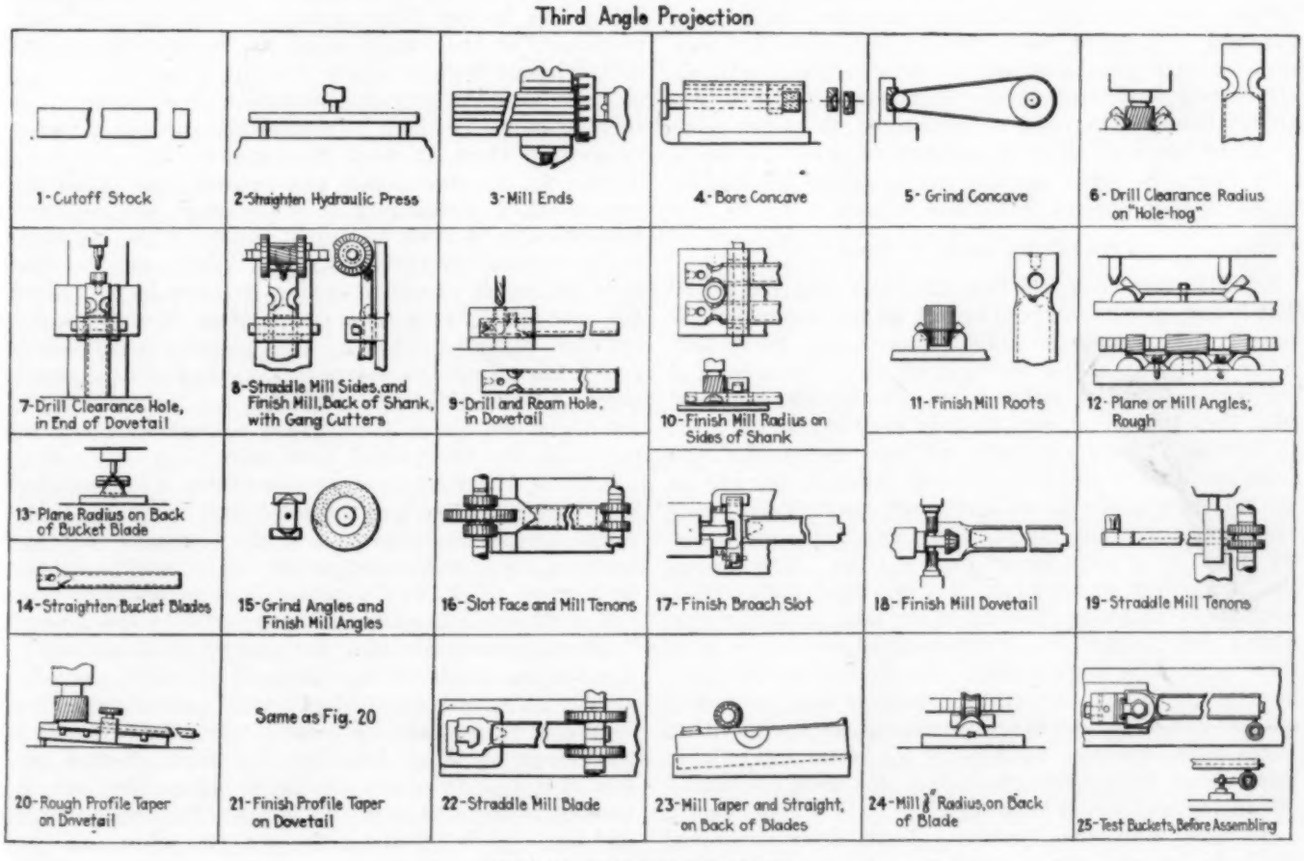

Third Angle Projection
1-Cutoff Stock
2-Straighten Hydraulic Press
3-Mill Ends
4-Bore Concave
5-Grind Concave
6-Drill Clearance Radius on "Hole-hog"
7-Drill Clearance Hole, in End of Dovetail
8-Straddle Mill Sides, and Finish Mill, Back of Shank, with Gang Cutters
9-Drill and Ream Hole, in Dovetail
10-Finish Mill Radius on Sides of Shank
11-Finish Mill Roots
12-Plane or Mill Angles, Rough
13-Plane Radius on Back of Bucket Blade
14-Straighten Bucket Blades
15-Grind Angles and Finish Mill Angles
16-Slot Face and Mill Tenons
17-Finish Broach Slot
18-Finish Mill Dovetail
19-Straddle Mill Tenons
20-Rough Profile Taper on Dovetail
Same as Fig. 20
21-Finish Profile Taper on Dovetail
22-Straddle Mill Blade
23-Mill Taper and Straight, on Back of Blades
24-Mill 1/8" Radius, on Back of Blade
25-Test Buckets, Before Assembling

FIG. 10—OPERATION SHEET

What *Is* Wrong with the Railroad Shops?

By L. J. Voorhees

The articles that appeared in the *American Machinist*, entitled "What's wrong with the Railroad Shops?" call to my mind experiences while grooming the "iron horse." These experiences have been the fount of many amusing reminiscences, especially as they were not gained in a "one horse" shop, but in one of the largest and best equipped shops in the country.

When I entered this shop the building was not entirely completed and the machinery was just beginning to arrive. As fast as it was located and connected up workmen were hired to operate it. They seemed to be in two distinct classes; those who came from railroad shops, and those who did not. The railroad shop men did their work in the same manner as followed in the particular shop they came from and their methods were similar. Their greatest common outstanding feature seemed to be their complacent satisfaction with their old methods, and an aversion to learning new ones. The other men, conversely, were continually devising new methods of doing better and quicker work.

Two Fox lathes were installed to handle the small brass parts for the air brake and valve departments. Finally a man came in who had worked in a brass turning department on a similar machine and he was given one of them to run. About this time the shop was put on piecework. The lathe prices had been established on engine lathes. Apparently, this man was not familiar with piecework or the customs of restricting the daily output as his first day's work came to over $20. This was more than machinists made in a week at that time. But, did they cut his piecework prices? No! Instead, they told him the maximum amount he was supposed to turn in for a day's work, and that was what he turned in each day from that time until he left, nearly two years later. This restricted his output to about what an engine lathe could do on the same work, which was about a quarter of what he could have done. So the shop lost the increased production of which this type of lathe was capable.

Production Gone to Seed

Several years later I visited this same shop and found that it had either discarded or lost all the improvements made by the new men while I was there. Work was being done just as the railroad shopmen have done it for years. The Fox lathes were idle and when I asked why, they told me it was hard to keep a man on them as they didn't have automatic carriage feeds and a man must stand there and feed them by hand all day and he got no opportunity to sit down and rest. Valve seats were made without gages. Packing rings were bored one piece at a time in an engine lathe. The special chucks holding two sets at a time were gone. Men were spending hours grinding in dry-pipe packing rings, where they should have spent minutes and all because they were made inaccurately. As the arbors were lost, hex nuts were held in a milling machine vise and milled one flat at a time, and so on throughout the shop. Other shops were advancing by striving for better and quicker methods of doing their work, but this shop instead of advancing was going backward.

Talking with the foreman about using improved methods brought out a number of reasons why they thought it impractical, but they would not have been considered serious obstacles in other shops. In general, they seemed to feel that there was a satisfactory method of doing each job and that the men understood it and could perform it without much supervision. Futhermore, the men did not like other methods or understand them. Therefore it required more supervision and there was more likelihood of spoiling something, of which the foreman seemed to have an inordinate dread. Time could be wasted without having to answer for it, but I was given to understand that when a part was spoiled, someone "walked the carpet."

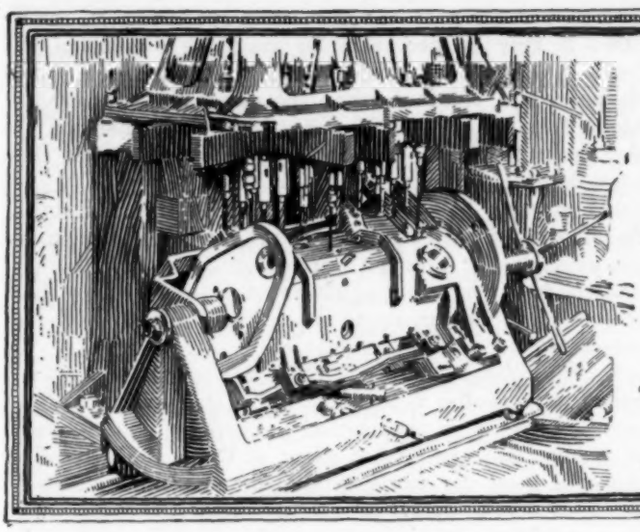
Apathy of the Men

With the men, their reasons were simpler. They had worked and learned their trade and they were getting the shop's wages for machinists, so why should they try to learn new tricks or work faster? They would get no more for it, and if they spoiled something they would catch hell. This was about the usual reply to my inquiry about using quicker or easier methods. As a rule the men seemed to think that the more work they turned out the harder they must work. They seemed unable to comprehend that by using improved methods it would be possible to do more work with the same effort. This seemed to be the result of improper training which began with their apprenticeship. When learning their trade, the "old timers"—using methods learned in their boyhood from other "old timers"—were held up as the best men in the shop. Naturally, their antiquated methods were the ones followed by the apprentices. This handing down of shop methods is like handing down clothes, it keeps making them older and more out of date.

A recent visit to this shop again confirmed my former conclusions. The men seemed to lack the incentive of being able to get more money as they become more proficient, so they work along as though on a treadmill, without hope or thought of improvement. Many of them have the mistaken idea that the "Company" is their enemy. To them, new methods are just a means of getting them to work harder and turn out more work. So, for this reason and because they dread the mental effort of changing, they oppose all new methods. Piecework is to them an unjust means of making them do more work for their day's pay. They also feel that it is an unjust means of spying on them by recording the amount of work they do, so they carefully watch the time reported for doing each piece to make sure it is not low enough to endanger a cut in their piecework prices. Losing their jobs and having their wages cut are their two chief fears. Lack of initiative and cooperation are their chief drawbacks.

A little education in what constitutes a "Company;" how it is organized and managed, and that they, themselves, are an essential part of the Company they distrust, is one of their chief needs. This should put them in a mood to cheerfully accept improvements in tools and methods, especially if an incentive were offered. Basing compensation upon the amount accomplished instead of the length of the effort should make it possible to offer an incentive and effect a saving at the same time.

Of course, the starting point for any improvement is the minds of those directing the work effected, and now that the *American Machinist* has pointed out the need, it is up to these minds to make the improvements necessary to bring the railroad repair shops up to a level with other shops.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of gages continued—Principles employed in gaging—Methods of gaging and applications to various types of work

IN ORDER to illustrate the advantages of part drawings on which the limits are carefully specified, an example of a sliding gear is shown in Fig. 522. Attention is called to the careful manner in which the diameters are specified both for turning and grinding, as well as shoulder distances and widths of slots. The example shows a part which must be heat-treated and then ground after hardening. For this reason the diameters are marked with sizes for both turning and grinding, and the latter have tolerances specified. As a matter of fact, it would be of advantage to provide tolerances as well on any diameters which might be used to set up the work, in order that the parts would be made to such sizes that they would fit the jigs or fixtures used. Also, the shoulder distances in one or two cases could be specified as ± ¼ in. In general, however, this drawing is a very good example of a part on which the important tolerances have been carefully specified.

A great advantage obtained by the use of this system is that all questions regarding the accuracy of certain dimensions are immediately settled by a reference to the drawing, so that it is unnecessary for the workman to communicate with the engineering department or the foreman in order to find out how closely certain parts must be made to given dimensions. If the engineering department and the tool department co-operate with each other, a great deal of time can be saved by establishing the limits in accordance with the requirements of the work and placing them on the drawing when the machine is first designed. By this means a great deal of experimental work can be saved in the fitting of the first models made. After the model has been made, any changes desirable may be incorporated on the drawing.

As in our previous articles we are endeavoring to bring out principles and show their application by means of graphic examples, in order that the designer may understand the important points which apply to each individual subject. After the tolerances have been established the gages must be so designed that they will produce the work and keep it within the limits specified. There are a great many different conditions to be considered when gaging a product, and in Fig. 523 we have endeavored to bring out some of the most important of them by means of diagrams.

In the example shown at *A* the work *B* is a shaft which is to be gaged for the diameter and within certain limits. The common method of gaging a piece of this sort is by means of a holder which contains two

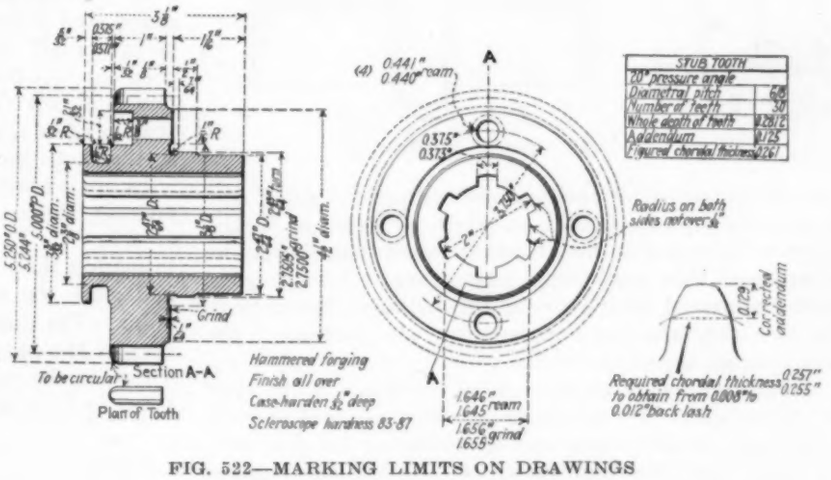


FIG. 522—MARKING LIMITS ON DRAWINGS

gage points *C* that are set the correct distance apart so that the work may pass between them if it is not too large. There are two other points shown at *D* which are set apart so that the work will not pass between them unless the diameter is too small. In other words the points *C* form the "go" portion of the gage, and the points *D* the "no go" portion. Gages which are used in this manner are usually termed snap gages and they are made in a number of different forms which will be mentioned later in the article.

A shaft may be finished so that certain portions of it are apparently correct as tested by the snap gage shown at *A*, and yet hard and soft spots in the shaft may produce an effect such as shown in an exaggerated way

For the authors' forthcoming book. All rights reserved.

at *E*. Here the diameters *FFF* and those at *GG* are different, due to variation in the quality of the metal which has been machined. The snap gage might be tried at the points *F*, and it would be found that the work passes inspection. On the other hand, if tried at the points *G*, the work would appear over-size. Therefore, for a test which will determine whether the work is cylindrical or uneven in its nature, a ring gage like that shown at *H* can be used. By slipping this type of gage over the shaft and passing it along, the high spots

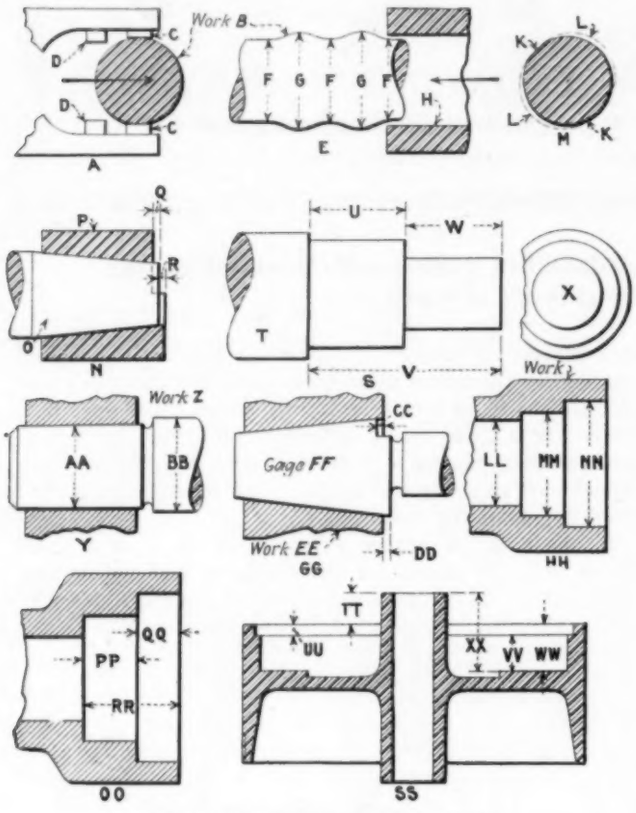


FIG. 523—PRINCIPLES OF GAGING

can be detected by the uneven feeling. Also, if the work were out of round or eccentric, as shown at *M*, the gage would not slip over it and it would immediately be discovered that something was wrong. A snap gage could be passed over the points *K* and show the work to be all right, whereas if passed over the portions *L* the work would appear over-size.

In gaging taper work such as the shaft in the view at *N* there are two points to consider. One of them is the angle of the taper and the other is its diameter. A taper shaft like that shown at *O* is commonly gaged by means of a sleeve *P* which is slipped over the shaft, and the diameter is determined by the position of the small end in relation to the end of the shaft. The gage is cut away on this end so that the limits are indicated by the shoulder. The work if correctly machined would stick through the gage a distance shown at *Q*, and it would appear slightly back of the other shoulder a distance shown at *R*. In other words the end of the piece should lie in the position shown if correctly machined, but any position between the shoulders would be satisfactory.

An example of a shouldered shaft is shown at *S*. In this case the work *T* has two shoulders *U* and *W* and their lengths must be kept within certain limits. The gaging of a shaft of this kind is dependent upon the assembly of the part and the limits specified. In some cases it may be necessary to gage the dimension *W* from the end of the shaft and the dimension *U* as shown, while in other cases the dimension *W* may be gaged from the end of the shaft and the dimension *V* also from the end. The general requirements of the work determine the method to be used.

In gaging a hole with a plug gage of the limit type the plug itself has two diameters *AA* and *BB*, shown in the example *Y*. The *AA* portion of the gage must go into the hole while that at *BB* must not enter. For this reason it is customary to make the portion *AA* considerably longer than the part *BB*.

In the example shown at *GG* a tapered hole is to be gaged with a plug taper gage *FF*. The same principle is used here as in the case of the tapered shaft shown at *N*, the gage being cut away at *CC* a sufficient distance to keep the work within the required diameter. The portion *CC* should be slightly inside the hole, while that at *DD* should protrude a trifle.

Gaging Diameters in Multiple

Another example is shown at *HH* as a piece of work which has three diameters *LL*, *MM* and *NN*, all of which are to be gaged. Inexperienced designers frequently make errors in designing gages for this class of work and try to make one gage to test all of the diameters. This practice should never be followed as such a gage is not practical. Each diameter *LL*, *MM* and *NN* should be gaged by separate limit gages and their concentricity must also be determined by separate gages if these points are important. The depth of the work must also be gaged separately, although it is occasionally possible to make indicating gages which would register two different depths on the same gage.

In the example *OO* the distances *PP* and *QQ* must be gaged, and it is important that the dimension *RR* should be preserved. For this reason the depth gage which is used for this purpose should work from the outside surface and not from the shoulder *QQ*. Here also it is possible to design a single gage with indicating points so that both shoulders can be gaged at the same time.

In the example *SS* a large casting is shown and the points of importance which must be gaged are indicated at *TT*, *UU*, *VV*, *WW* and *XX*. It would be advisable in gaging these depths to work from the end of the hub, and gage the dimension *XX* as well as *TT* from this point. The dimension *UU* can be determined from the face of the flange. A great deal depends upon the condition of the product and how it fits the adjacent members, and in all gaging problems these points should

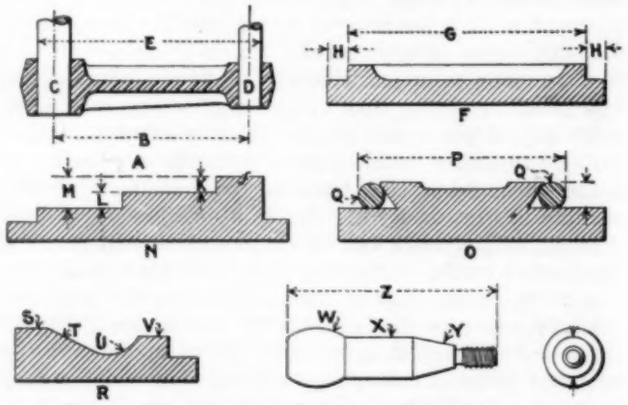


FIG. 524—DIAGRAMS SHOWING APPLICATIONS OF GAGING TO VARIOUS TYPES OF UNITS

be considered before an attempt is made to design the gages.

A number of other applications of gaging to various types of units are shown in Fig. 524. In the example shown at *A* the distance *B* between the centers of the two holes *C* and *D* must be gaged. The principle used on this kind of work would be to employ a plug in each hole and gage across the points shown by the dimension *E*. If a toolmaker were to measure a piece of work of this kind, he would "wring" a plug into each hole *C* and *D* and then measure across the dimension *E* with micrometers. A similar principle can be applied by means of suitable gages.

In the example shown at *F* a casting must be gaged across the shoulder *G* and also on the two points *H*. In this problem a great deal depends upon whether the outer edges of the casting are rough or smooth, and it would generally be found advisable to first gage the distance *G* and then inspect the portions *H* separately, working from the shoulder. If a finished casting were to be gaged, the outside would be gaged first to the shoulder *H* and then the portion *G*, one of the steps being allowed to come as it would.

Methods of Gaging Parts

In the example *N* there are several surfaces *K* and *L* which must be gaged from the upper finished surface. As a general thing it would be better here to gage the portion *K* from the upper surface and the distance *M* from the same surface. Otherwise the dimension *L* might show an accumulation of errors which would injure the product. Here also, the general conditions might effect the method of gaging.

In the example *O* the dovetail portion is to be gaged. This operation is ordinarily done by means of a templet gage which shows the general form of the dovetail, and afterwards measurements are taken across steel rods shown at *Q*. The depth shown by the arrows can be measured by a depth gage.

In the example *R* an irregular piece is shown and the various points to be gaged are indicated at *S*, *T*, *U* and *V*. There are several methods of measuring work of this character and the accuracy required determines the method used. The most common type of gage for this work consists of a templet which is cut out to fit the form of the piece to be gaged. The templet is placed on the work and the inspector examines the contact to see whether or not the contour is as it should be. If the templet does not show light between it and the work, the latter may be considered as passing the inspection test. Another method of gaging a similar piece is by means of an indicator and a form block using the ordinate method, which will be described in a later article.

In the example shown at *Z* the work is a stud of special form having a spherical portion *W*, a cylindrical portion *X* and a tapered portion *Y*, in addition to the thread at the end. The over-all dimension *Z* of this piece is comparatively unimportant, and the thread diameter can be easily inspected by means of a thread gage. It would not be wise to attempt to gage the portions *W*, *X* and *Y* with the same templet gage, as any slight errors in the shoulder distances would make the gage useless. The portion *W*, however, can be used as a surface on which to rest a templet gage which would determine the angle *Y*, or a tapered sleeve can be placed on the latter as previously described. The portion *W* can be tested by means of a templet, one portion of which can be rested on the cylindrical part *X*.

These various examples have been given in order to illustrate the problems with which the designer comes in contact when making gages. There are many conditions of a special nature which arise from time to time and which call for the exercise of considerable ingenuity in order to make sure that the principle used is correct. In general it should be considered as a fundamental point in gaging that the most successful types of gage are those which not only tell the operator that the work is wrong or right, but at the same time give him some indication as to how nearly it is approaching one extreme or the other. In other words, the best type of gage is one that "tells a story" and modern gaging practice is tending more and more in this direction. Naturally, the designer who wishes to become thoroughly conversant with the subject of gaging should endeavor to make his designs as up-to-date as possible.

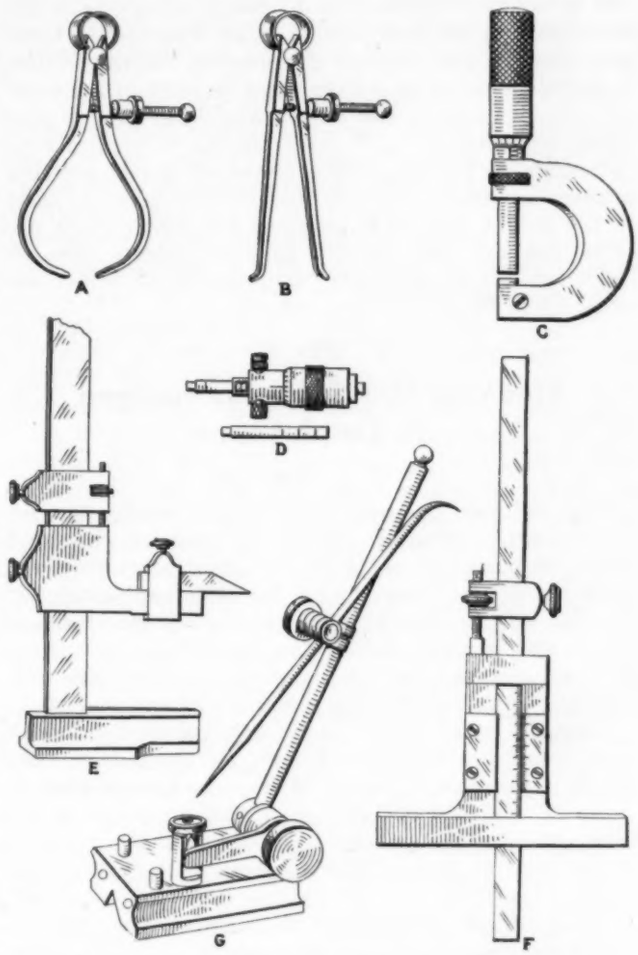


FIG. 525—STANDARD MEASURING INSTRUMENTS

Standard Measuring Instruments

There is a great difference between a limit gage and the toolmakers' instruments for measuring, and yet there are points of similarity between the two, and many of the principles used in the standard instruments can be applied to special gages. Fig. 525 shows a group of well-known standard measuring instruments. The example *A* shows an outside caliper, while that at *B* illustrates a caliper used for making inside measurements. Our old friend, the micrometer, is shown at *C*

and the inside micrometer is indicated at *D*. The example at *E* is a height gage and that at *F* is used for measuring depths. The diagram *G* represents a surface gage commonly used by the toolmaker. These examples are given not because they are particularly remarkable, but principally because nearly all gages are based on some of the principles used here.

If a toolmaker were asked to design a gage he would doubtless first consider how he would measure the same piece of work with his own instruments, and the natural development would be a gage based on some of the principles shown here. The micrometer head can be purchased as a separate unit and often can be applied with advantage to gaging certain pieces of work requiring extreme accuracy. So, also, the vernier principle used on the height and depth gages is frequently made use of in gaging. The surface gage is nothing more or less than a type of feeler, applications of which are often found in accurate gage work.

Thinking Should Be Encouraged in Employees

By C. J. Morrison

Your editorial on page 166, "Self-expression or Sentimentalism," certainly strikes the nail on the head about the bunk that is being circulated concerning the worker's lack of opportunity for self-expression; but this subject, in common with most others, has two extremes and it seems hardly fair to dismiss the matter with an editorial which seems to condemn all self-expression during working hours.

There are many small and a few large shops in which every employee is allowed full self-expression, and where each piece of work is done as the individual doing it may elect. These shops furnish many of our bankrupts and the system, or rather lack of system, is so bad that it may be dismissed without further discussion.

At the other extreme are the shops which allow no self-expression whatever, but prescribe in detail exactly how each operation is to be performed and will not tolerate any deviation. The employees are merely cogs in a wheel, and are sometimes told that they are paid to work and not to think. In large-quantity production work where a fixed number of each part must be produced each day in order to keep the plant balanced and to complete the desired number of finished articles, it is not practical nor advisable to allow any deviation from the prescribed methods; but is it desirable to stifle all thinking? Some of the most successful plants, which are continually making improvements, encourage thinking and reward those who produce useful ideas; but the employees are not allowed to put the ideas into effect until they have been approved. Isn't a shop containing 1,000 thinking men far stronger than one with five who think and 995 who are forbidden to use their brains?

Some things which are expensive to the owners and amusing to others occur in shops where only the selected few are allowed to think, and two instances will be given as illustrations. These cases show different phases of the danger. A machinist had a turning and facing operation on a machine part of which many thousands were made each year; and as his instruction card called for first turning and then facing, he proceeded accordingly, made standard time and was paid a bonus. This work had been going on for several weeks when the president of the concern, who was a practical machinist, happened to notice the machine one day and asked the operator, "Why do you suppose that machine has two tool heads?"

Much to his surprise the man answered, "So I can turn and face this piece at the same time." The president then somewhat wrathfully inquired, "Then why don't you do it?" and was told, "Because we are obliged to follow the instruction cards." That card was changed, but the rigid system was retained. There may be and probably are many other wasteful operations in that shop.

Employees "Not Paid to Think"

The second example was in another shop where a few "know it all" and the others are not permitted to think. An apprentice on a boring mill was given thirty-six eccentric straps to bore and, as usual, the tools, gage and instruction card came along with the order. As soon as the first strap was set up, the boy became convinced that he had the wrong gage, as to bore the straps to the gage would leave only a thin shell; but the number on the gage checked with the instruction card. However, he hated to spoil a lot of work, so decided to take a chance on being "jumped on." He went to his foreman, who churlishly said, "Bore them out to that gage. You are not paid to think." The boy went ahead and spoiled the thirty-six eccentric straps, and they went to join other parts in a large and flourishing scrap pile.

These cases are given simply to illustrate the kind of things that happen in such shops right along, and which could be prevented if a little thinking was permitted. Also, the thinking would have a good effect on the employees and might help to produce some good mechanics, the lack of which is continually being deplored. The large-quantity production shops cannot permit self-expression, except in the way of encouraging the submission of ideas to some person or committee appointed to receive them, and full self-expression should not be permitted in any shop; but there is a happy mean which is used in a few shops and which could be used in a great many.

The Best System to Follow

In these shops are to be found standard tools, instruction cards, time limits, etc., but the employees are permitted to vary from the standard instructions if by doing so they can perform the work in less than standard time. As there is no bonus when standard time is not attained and as the time lost must be made up on other jobs before a bonus is paid, a man does considerable thinking before he risks a deviation from the standard instructions. In fact, he usually consults with his foreman and the rate setter before making a try. New methods are continually being discovered, and these plants make great progress. The worker whose self-expression enables him to perform operations in less than the standard times gets his reward in the larger bonus which he earns.

There is certainly a lot of bunk about self-expression, but there is also undoubtedly great danger in the total suppression of it during working hours, for to do so is liable to lead to many costly mistakes and is sure to stifle progress.

Who Was to Blame for This Injustice?

By Alvaro De Palante

The following little story is true in every detail except that, for obvious reasons, a substitution has been made in the case of proper names:

In May, 1920, the Blank Manufacturing Co. was going so strong that it became necessary to put on more machinists and, as none were available in the town, an agent was despatched to a neighboring city to obtain them. In due time he returned with several men, among them being Rob Brown, the unfortunate hero of this story, who had been induced to join the venture because of being on short time and in constant fear of a lay-off.

Rob was a good workman and distinguished himself almost immediately. He spoiled no work (most new men do) and his rate of production was high from the third day of his new employment. He was moved from one job to another in the department as occasion demanded and performed all tasks equally well.

After being with the company for several months, Rob took occasion to ask his foreman how he stood with his employers; for, he said, if he could be assured of steady employment he would like to bring his family from the city and make a home for them near his work. Upon receiving the desired assurance he proceeded to move his household goods and establish his family in a convenient suburb. Shortly afterward he bought the property.

The Foreman Quits

As time went on everything seemed to be going along nicely until one day the foreman developed a bad case of wanderlust and departed his job without the formality of notice to his employers. A new foreman was needed at once and, naturally, the thoughts of the superintendent turned to Rob Brown, who had proved himself so capable as a workman.

Summoned to the office and confronted with the proposition, Brown seemed to doubt his ability to handle the job. Said he had never had experience as a foreman and feared that he might not measure up to expectations. Upon being assured that the company would stand back of him and be patient with his inexperience, he agreed to try.

He did try, and tried hard. He met many of the problems of his new job well. Others bothered him some, chiefly those having to do with records with which, as a workman, he had never been concerned. Some of the clerks who were annoyed by his mistakes lost no opportunity to criticize him to the superintendent and to make life miserable for him.

Conscious of this state of affairs, Brown went to the superintendent and asked to have his old job back, but as that official had no one better to take the place and as the old job was being handled satisfactorily by another workman, Brown was persuaded to continue as foreman.

Then came the depression. Business slowed down, men were laid off, inspectors were put back on the job of running machines and foremen were required to assume the duties of inspection in addition to their regular work. As most of the foremen in the shop had come up from the ranks through the office of inspector they found little difficulty in taking on their new responsibilities.

Not so with Brown. He could never remember to inspect another's work, "just as if you *knew* it were wrong." Defective parts began to find their way out of his department, to be discovered by the erectors who tried to assemble them.

Finally a large order of extra parts had to be filled, "rush." Brown started his best man on the job and sent another one home to rest so that he could report that evening for night duty. In the morning the required number of pieces were finished and they were tagged and passed along to the shipping department, Brown himself signing the shipment as foreman.

Late Discovery

An hour or two later the day man who had worked on the job came to him and inquired: "Say, Bob! Have those rush pieces gone yet?"

"Yes. Why?"

"Well! I have just discovered that Harry set up a new cutter head last night and upon examining the work from it I find that all of the work he machined with it must have been too small on one diameter."

Brown got in touch with the shipping department, only to find that the parts had been shipped. Then, because he did not know what else to do, he did nothing.

A week later he was called into the office to listen to the reading of a letter, the writer of which had indulged in some forceful language expressive of his feelings toward the Blank Manufacturing Co., stating that one-third of the pieces received were useless, that "you could throw a cat through the hole after they were assembled," etc., etc., and closed with the statement that hereafter their business would go to Jones & Co., even if the price *was* higher.

"While you let that soak in," said the superintendent to Brown, "go out in the shop and start another order to replace the defective parts. We will have to get them there before that blankety blanked Jones & Co. can get started on the job. Then you can come back and tell me how in Hades this thing happened."

While Brown was gone the sales manager, upon advice of the superintendent, despatched a telegram to the irate customer informing him that duplicate parts to replace the defective ones would be forthcoming in the morning.

An hour later Brown came into the office wearing his most distressed look. "There is not enough material in stock to make more than one-half the order," he reported, "and I cannot find any more anywhere in the shop or at any of the local dealers."

The superintendent seized the telephone and was soon in communication with the purchasing agent. "How come you didn't know that we were out of 2-in. square cold rolled?" he shouted. "You didn't know until an hour ago that we were low?" "Didn't you receive the stockroom requisition a week ago when we took the stock for that order of extra parts?" "A plain blue slip?" "The devil you say!" and he hung up the receiver with a bang. As he faced about, the office boy handed him a telegram which proved to be from the customer and read as follows: "Depending upon new parts promised; have canceled order to Jones & Company."

That was the straw that broke the camel's back. The superintendent was in a rage. Turning to Brown he said: "First you requisition material from the stockroom on a plain blue slip when it was not for a stock order but to meet an extraordinary demand and should have been on a red slip as you very well know."

"I forgot," said Brown, feebly.

"Then your man spoils a third of the parts on the order and you send them out without knowing anything about it. How did it happen that you never knew these pieces were too small?"

"I did sir," responded Brown, "but the order had been shipped."

"What!" yelled the superintendent, "you knew a week ago that those parts were not worth a damn and you did nothing about it?" "Say! Brown, you are too dumb for us."

Brown Loses His Job

Brown went out, and about half an hour later received official notice to the effect that his services would not be required after the first of the month.

That night Brown said to his wife, "I never wanted the job as foreman, and I have never been so unhappy as since it was wished on me last May." "I would have been glad to take my old job back any time and I know I can do more and better work as a machinist than any other man in the shop. Now I am out of a job with little chance of finding another at present, while the man that is on the job that I didn't want to give up is still there, although the superintendent well knows that I am a better man, have been longer with the company, and have tried hard to work for their interests."

Brown was out of work for nine long months, and eventually found a position back in the city from whence he came and where he might better have stayed. Further, he was obliged to sell his home, subject to a mortgage that he was obliged to place upon it to settle with his creditors and meet the expenses of removal.

Who was at fault?

The Millwright—Discussion

By Harry Senior

GEORGE WALTER, writing under the above title on page 414, Vol. 58, of the *American Machinist*, seems to have made an important re-discovery, though his researches are as yet incomplete. He says that "During the last decade" the millwright has made his appearance in a majority of the machine shops around the country. I am not at all familiar with shops and conditions in that part of the country from which Mr. Walter writes but, speaking from New England, I want to say that the millwright has been here a long time; indeed, he may lay just claim to being the predecessor of the modern "machinist," and I think that we can afford to generalize with New England as a basis.

A Family of Millwrights

I was not born yesterday—in fact my whiskers are getting quite gray around the edges—yet one of my earliest boyhood friends and advisers was a millwright, and his father and grandfather before him were millwrights. Both of my own grandfathers, born 116 and 113 years ago respectively, were millwrights and each proved many times over that he was competent to build a mill, set up the machinery therein, and to personally attend or superintend the many minor jobs that go toward its maintenance. In fact one of them owned his own sawmill where he got out the timbers to be used in mill construction, and this sawmill together with most of its machinery he built himself, even down to the water wheel that furnished the power to drive the machinery.

One hundred years ago machinery was far less complicated than it is now and wood as a raw material to be used in its construction was more common than iron. I have heard my grandfather tell of line shafts made from oaken timbers 10 in. square, with journals laboriously worked down to comparative roundness by hand, and with wooden drums built upon the shafts to serve as driving pulleys. Water wheels were more often made of wood than of iron, and a capable millwright was expected to, and did, build such wheels from the ground up. In this year of grace 1923, when even the comparatively youthful steam engine has apparently run its race and is being displaced on every side by the whirling electric motor, I can lead Mr. Walter to a New England factory, the product of which bears a world-wide reputation, that today derives its power from two old-fashioned breast wheels 28 and 32 ft. in diameter by 12 and 16 ft. breast, respectively, and these wheels, built by millwrights, were old when I was a boy fifty years ago.

The All 'Round Machinist

The man we know today as the "old fashioned all 'round machinist" is himself a specialist, descended from the millwrights who built their machinery mostly of wood, who has "specialized" in machinery built of iron and steel. If Mr. Walter will go to any paper mill and ask to be shown the "machine room" he will (if he is lucky enough to get in at all) be conducted to a building wherein he will find one or more machines a hundred feet or so in length, busily engaged in turning out *paper*; while if he should then go to the "millwright's department" he will find himself in a "regular" machine shop containing lathes, planers, drilling and milling machines and all the paraphernalia of the up-to-date machine shop.

No! Mr. Walter, the millwright is not a new institution. He has been here all the time. Whether he is known as a "millwright," "machinist" or "maintenance man" depends upon where you find him and not upon what he does. He can not only "do a simple job of bushing in an idle lathe" (which will not be idle while he is using it) but he can figure diameters of pulleys and calculate speeds with certainty and dispatch. He will probably "stand back in the shop and 'squint' with one eye" while his men jack a machine into position, but he will not have to cut off the belt at an angle to make it stay on the pulleys and you may rest assured that the 6-ft. zigzag rule that you can see sticking out of his hip pocket is not a mere ornament or insignia of his calling. He can make a "fit job without extreme accuracy" with it, too, under conditions that would take the heart out of some of the white-aproned or dust-coated toolmakers that talk in tenths of thousandths; and he is quite competent to "change the back gears of a milling machine" or to make new ones for the same if necessary.

As to how much he is paid is quite another matter, one that is more likely to depend upon market conditions than upon the actual value of his services. Whether he gets more now than in the old days or vice-versa is open to question; it is a matter of comparative values. I think my grandfather used to get 1.50 per day of 12 hours—but even George Washington was willing to admit that a dollar used to go farther then, and George ought to have known, for it is said that once upon a time he threw a silver dollar across the River Delaware.

Making Shafts for Hydraulic Turbines

BY HOWARD CAMPBELL
Western Editor, *American Machinist*

Forging and machining operations on 24,000 hp. turbine shafts—Methods used in producing high-grade forgings—Inspection and assembly methods

LARGE WORK is always interesting, and the production of the shafts for a set of three hydraulic turbines that are being built in the shops of the Allis-Chalmers Co., Milwaukee, Wis., is not an exception.

Six shafts were required for this job—three with flanges on each end and three with flanges on one end only. The forgings were made from selected ingots and heat treated. The forgings for the single-flange shafts were 26 ft. 6 in. long, while those for the double-flange shafts were 31 ft. 6⅜ in. long. The diameter through the body was 25 in. and through the flanges 3 ft. 7½ in. In order to insure good forgings it was necessary to make a substantial reduction from the original area of the ingot to the finished forgings, therefore ingots were used measuring 56 in. in diameter in the smallest dimension. The forging was done under a 2,000-ton steam-intensifier type hydraulic-forging press as shown in Fig. 1. Two of the rough forgings can be seen in Fig. 2.

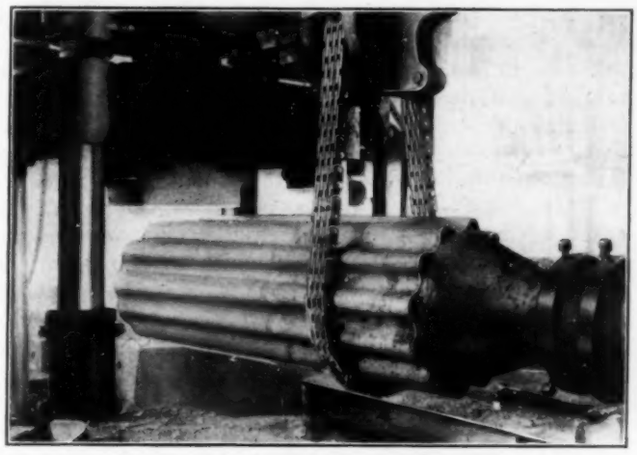


FIG. 1—2,000-TON HYDRAULIC PRESS IN ALLIS-CHALMERS FORGE SHOP

FIG. 2—TURBINE SHAFT FORGINGS

After forging, the shafts were heat treated to relieve them of all forging strains. The required physical properties were:

Elastic limit	35,000 lb.
Tensile strength	65,000 lb.
Elongation in 2 in.	25 per cent
Reduction of area	42 per cent

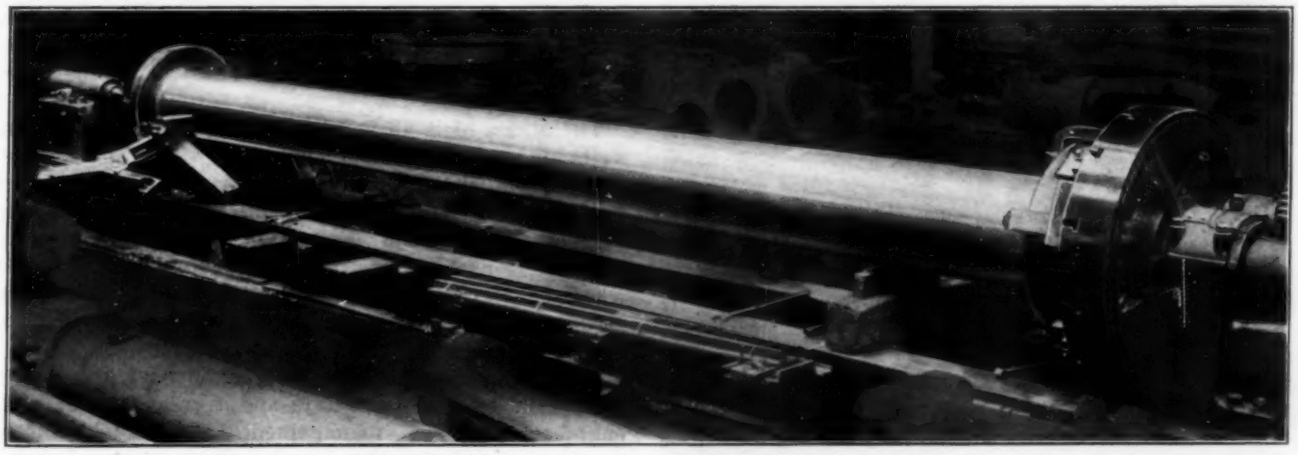


FIG. 3—TURNING A 31-FT. SHAFT

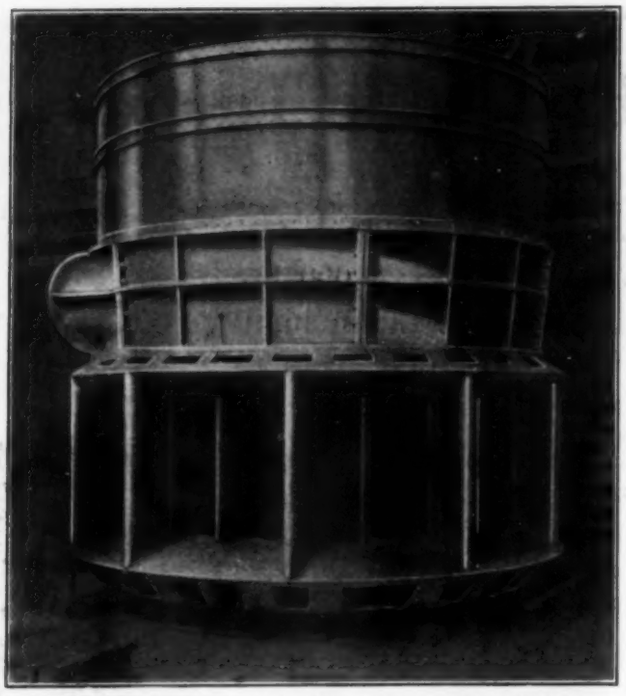


FIG. 4—ERECTING A 24,000 HP. HYDRAULIC TURBINE

The coupons having passed this test, the shafts were sent to the machine shop where they were rough-trimmed and 4-in. holes bored through the axes. The boring operation is done as a precaution to prevent unsound forgings from being shipped as the hole will betray any gas pockets or piping.

After the boring was completed, the shafts were examined with the aid of an instrument combining lamp, prism and telescope, three inspectors checking each other.

The finish turning operation is shown in Fig. 3. The shafts were finished all over and those having flanges on one end only were turned with a taper turned on the opposite end.

One of the turbines in process of erection is shown in Fig. 4. The massive speed ring, which forms the base or frame member, is embedded in the concrete spiral casing construction. The heavily ribbed pit-ring, which surrounds the gate-operating mechanism and within which the governor pressure-regulating cylinders are located, can also been seen.

FIG. 5—CAST-IRON RUNNER FOR 24,000 HP. TURBINE

The runner, Fig. 5, is of cast iron and was made in one pouring. Its weight, finished, is nearly 100,000 lb. This single runner develops 24,000 hp. under 70 ft. effective head, at a speed of 100 r.p.m. On account of the long vertical distance between the center of the turbine casing and the lower generator bearings—64 ft.—a babbitt intermediate guide-bearing is provided about midway of the shaft.

The Desire to Create—Discussion

BY W. ROLAND NEEDHAM

Elam Whitney's short contribution to the *American Machinist* under the above title, which appeared on page 729, Vol. 57, is at once stimulating and helpful.

The man who has not some such desire to create struggling to express itself, may be an altogether estimable fellow, but he cannot be classed as a real engineer. The *bona fide* engineer, whether he works in the shops or in the design or drawing office, is never so happy as when he sees ideas take tangible shape or content. The form that such ideas assume may be two-dimensional as on paper, or three-dimensional as in actual execution.

To an Edison, or to the humblest of his school, the keenest satisfaction comes when one's very own thought, dream, vision, conception or idea finds material expression. It is born, and it grows; and he who brought it into being has something of the joy and pride of fatherhood. This is his invention, his idea, his creation, it is in a way his child. Thus every time the mechanic conceives an idea which tends toward the improvement of the machine he works, his quest, if he do but pursue it, is one with that which Pasteur followed; he treks along the same trail where Edison marches even now.

This desire for self expression is an altogether legitimate and laudable one. Inventiveness *per se* should be encouraged, not suppressed. Far better call it into the open than drive it into dark and subterranean regions. The management which welcomes worthy and useful suggestions from whatsoever source, without prejudice or partiality, takes both a level-headed and wise view of things. That which approves itself should be assured of recognition, and the worker who makes good in this way should be assured without peradventure that he is really making good. Employers whose operatives are happy in the work they do, are to be envied. There is no happier man than he who works hard and well because he really likes the work he does.

The ethics of it all is sound to the core, also. I who write am an Englishman. One of my favorite essayists, however, is Davis Grayson, the American. Specially do I treasure Grayson's description of his friend the carpenter. Asked why he took such extreme care over the hidden parts of his work, and further questioned who would know even if he slacked a little there, the carpenter looked up in surprise, "Why, I will," he answered.

Let engineers feel what they do is part and parcel of themselves, and great days and a great future await engineering. The management which deliberately encourages such an outlook and such an attitude is helping forward those great days.

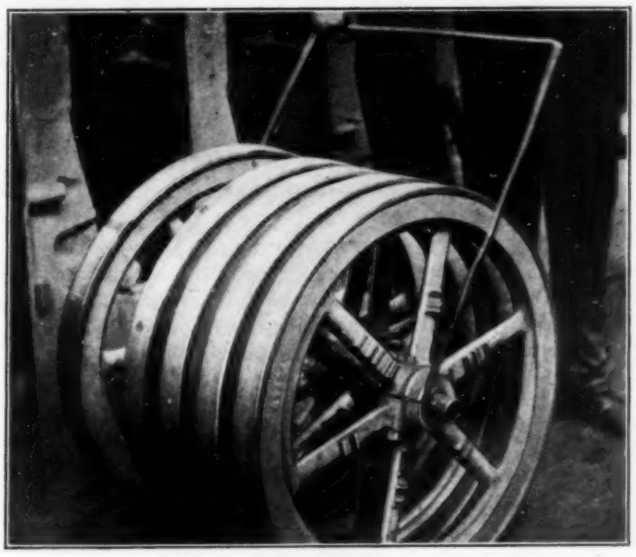
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Moving Gas-Engine Flywheels

BY E. V. ALLEN

One of the simplest ways to move either finished flywheels or rough flywheel-castings is shown in the illustration. A piece of common steam pipe long enough to go through several of the flywheel hubs is cut off and holes drilled through each end to receive the "handle" ends. A piece of half or three-quarter inch rod is bent as shown, with the ends turned down so as to go into



MOVING GAS-ENGINE FLYWHEELS

the holes drilled in the ends of the pipe. With a few flywheels and this device placed as illustrated, a man can trundle a bunch of castings or the finished product anywhere around the shop with very little effort and no lifting, except to stand up the wheels while putting the pipe through the hub holes. With several pieces of pipe available the clusters may be left together until needed and the handle used elsewhere.

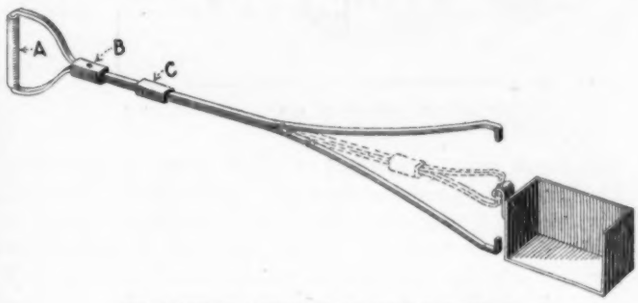
Improved Hook For Drag Boxes

BY R. A. FOLLENSBY

The ordinary hook used around the shop for pulling drag-boxes, or tote-boxes along the floor, made of round-section stock with a sharp pointed hook bent up at one end and a D-shaped handle formed at the other, is all right when the boxes to be moved are of wood or, if of metal, when there is a hole in the lip through which the hook can be passed. Many metal drag-boxes do not have this hole, however, and the ordinary hook, caught under the lip, is very likely to slip and give the workman a violent pitch forward, with chance for serious injury.

The sketch shows a substitute for the hook, made by one of the workmen in my department, that works well with either kind of box and cannot slip. It is made of ⅜x¾ in. key stock (though the size is immaterial) and three bushings. Bushing *A*, long enough for a suitable handle, is first slipped over the straight bar and the latter is then bent to form the spade handle as shown.

Before bending in the short angles at the ends, bushings *B* and *C* are slipped over the now doubled stock



IMPROVED HOOK FOR DRAG-BOXES

and bushing *B* secured by a pin close to the yoke that forms the handle. Bushing *C* is left free to slide up and down the shank.

To use the hook one of the short angular ends is placed over the edge of the box and the bushing *C* pushed down as far as it will go, thus bringing the opposite angular end up under the lip. The hook is now locked to the box and cannot be pulled away until the bushing *C* is returned to the upper part of the shank.

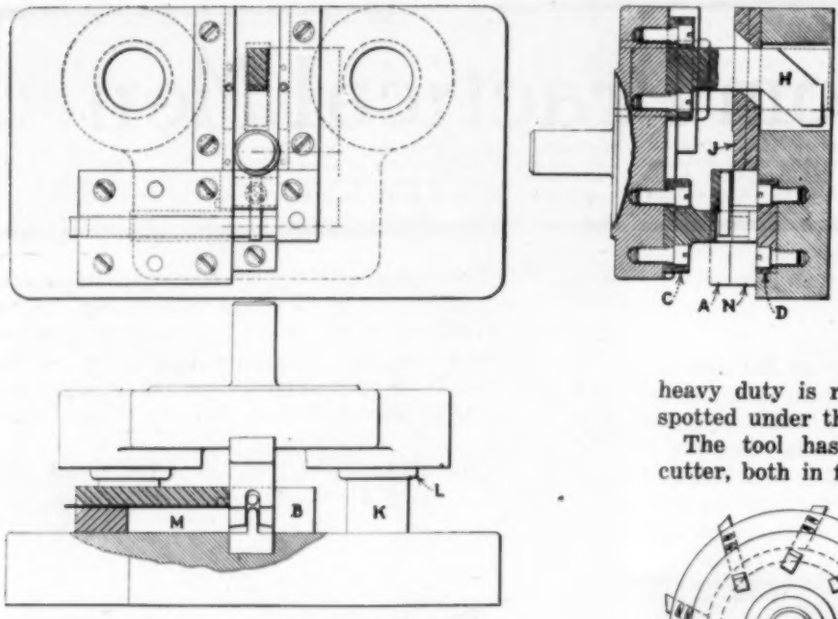
Combination Shearing and Forming Die for High Production

BY WALTER E. HILL

The operation of making small U-shaped clips out of ½ in. wide No. 22 gage sheet-metal for automobile cushion springs on a quantity production basis was satisfactorily performed by the combination shearing and forming die shown in detail in the accompanying drawing.

The stock is fed under plate *A* to stop *B* from the left hand side of the press by a roller feed mechanism actuated by the upward stroke of the press slide. The punch *C*, made of Ketos die steel, shears the strip of metal and bends it over the tool-steel forming die *D*, as shown in the end view. The stop block *B*, goes behind the punch and holds a ¼-in. pin which is straddled by the U-portion of the punch and prevents the finished piece from being carried up.

Because of the high production required and the fact that it was desired to have the operation entirely automatic (the only function of the operator being to replenish the supply of stock) it was necessary to pro-



COMBINATION DIE FOR MAKING U-CLIPS

vide some positive method of ejecting the finished part. This was taken care of by a tool steel cam *H*, operating in a slot in a machine steel slide *J*, which is cut out at the end so as to make a snug sliding fit around the forming die *D*. Hardened machine steel guide pins *K*, pressed into the die shoe and working in hardened bushings *L*, keep the die always in line and facilitate "setting up."

When the punch has moved upward ½ in. this slide starts to move forward and at the completion of the upstroke has traveled ⅞ in. shoving the formed clip off the die onto a pan in front of the press. On the down stroke the slide has completed its return movement before the punch hits the stock, effectively preventing any interference.

A noteworthy feature is the construction of the shearing die *M*, which is square and about 2½ in. long. *N*, is a machine steel plate the same size as the stock guide *O* and cut out to receive the shearing die which is 0.002 in. thicker than *N*, so that when *A* is screwed down it clamps the die securely in place. When one edge gets dull it is only necessary to loosen plate *A* and turn the die 90 deg., which exposes another shearing surface. When all four sides become dull the die is turned end for end and the process repeated.

A Cheap Inserted-Tooth Milling Cutter

By William E. Lang

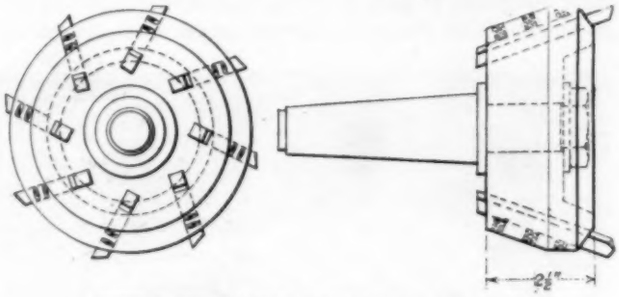
Having occasion frequently to use a large face mill for the roughing cut on castings to be used for jig and fixture work, I designed the tool shown in the accompanying illustration.

The body and shank of this tool are of machine steel, thus eliminating a large part of the first cost. The cutters are high-speed toolbits, ground ½ in. square and secured in their respective slots by setscrews.

The square holes for the toolbits were made by drilling and slotting the body in a No. 2 Cincinnati milling machine, using the universal attachment for the drilling and the slotting attachment, set in a horizontal position, to do the slotting. The locating keys were removed from the base of the dividing head so that it could be set at 5 deg. from the centerline of the table and the spindle was tilted upward to 30 deg. to correspond to the angle of the tool body.

The slots are at an angle to the radius of the cutter body in order to give the toolbits a radial rake, or shear, and at an angle of 5 deg. with the centerline of the tool to secure a face rake. The toolbits are secured with three setscrews each, and if heavy duty is required of the cutter the bits may be spotted under the points of the screws.

The tool has a decided advantage over the solid cutter, both in first cost and in upkeep, for as the bits



INSERTED TOOTH ROUGHING CUTTER

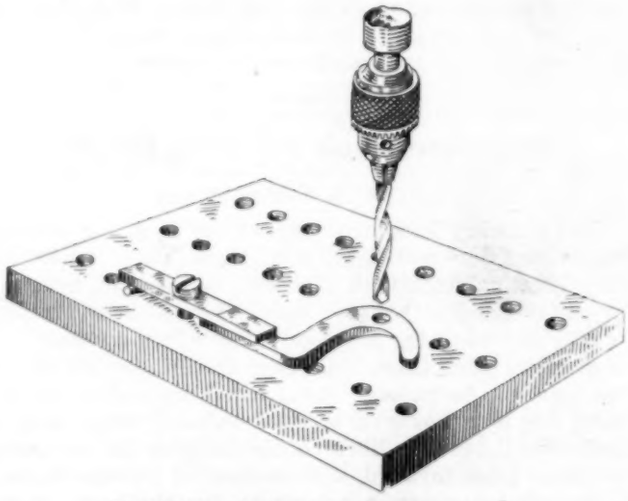
are ground back they may be advanced by changing their position under the setscrews, or when entirely worn out they can be easily replaced.

A Clamping Plate for Drilling

By Atol Maker

As a general rule small pieces are not so easily held in position for drilling as larger ones. There are several reasons why this is the case, the most evident being the lack of means for strapping the piece to the machine table.

To overcome this difficulty I employ a steel plate ½ in. thick, 4 in. wide, and 6 in. long, same being tapped out in numerous places to receive ¼ in. screws and ground to insure plane surfaces.



CLAMPING PLATE FOR SMALL WORK

A feature of this device is the fact that a job can be accurately set up by means of height gage, square, etc., while the job is on the bench, securely strapped in the desired position, and then carried to the machine for drilling.

When the piece to be drilled is strapped in position upon this plate, it is rigidly held in the correct relative position to the drilling machine table while at the same time it is free to be moved in relation to the drill and, unless the drill is very small, it will locate the job so that the drill will not be bent out of alignment with the axis of the spindle.

I sometimes find occasion to use this plate for holding pieces for surface grinding.

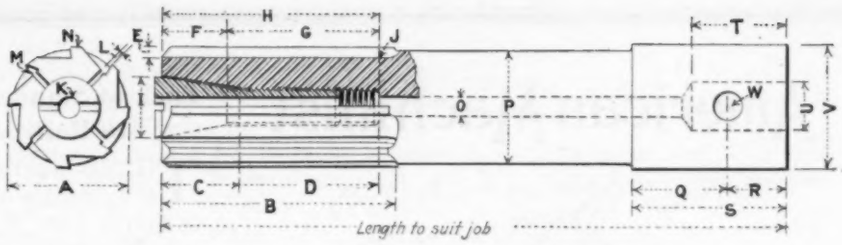
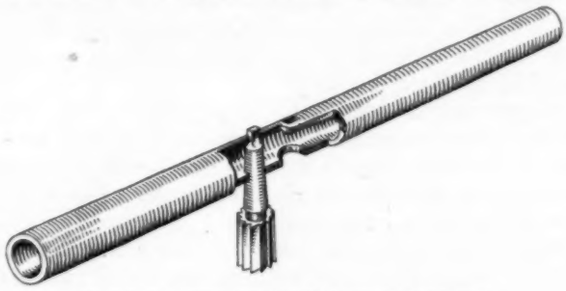


FIG. 1—ADJUSTABLE FLOATING REAMER

A Reamer and Drill Holder

BY G. W. NUSBAUM

One of the most useful tools any mechanic can carry around in his tool chest is the holder shown in the above illustration, made from ½ in. standard iron pipe. For hand reaming or drilling with taper shank tools, this device meets a long felt want and will not injure the



HOLDER FOR DRILLS AND REAMERS

shanks or tangs of the tools used therein, as would be done by clamping a lathe dog on the tool shank.

The tool can also be used for drilling in a lathe with a stationary drill, one end of which is held by the center in the tail-stock. If the holes are reamed to suit the taper of the tools to be used, it is surprising how tightly the holder will grip the tool.

Floating Reamer and Holder

BY HARRY J. MURPHY

A reamer designed for use in a screw machine and arranged to float in a holder is shown in Fig. 1, and a table of dimensions for such reamers from $\frac{3}{8}$ to $1\frac{31}{32}$ in. in diameter is given at the bottom of the page.

The fluted portion of the reamer is split in three or four places to allow for expansion by the taper-head screw shown. The shank is 0.01 in. smaller than the hole in the holder, in which the reamer is held by a slip-fit pin through a transverse hole in the shank. A longitudinal hole through the reamer and expanding screw provides a channel for lubricant to reach the cutting point.

The holder and adapter are shown in Fig. 2. The

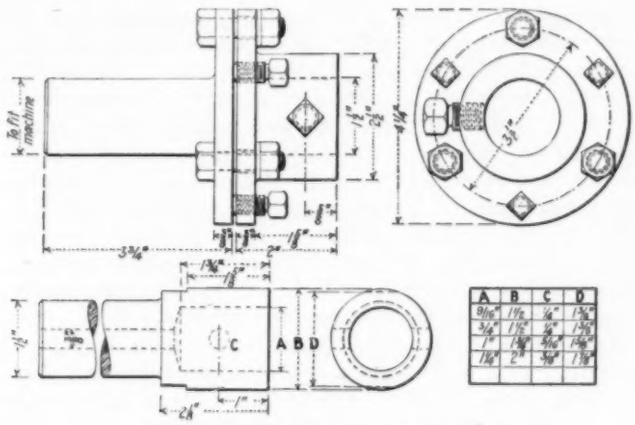


FIG. 2—HOLDER AND ADAPTER

holder is made in two parts so that it can be brought into alignment with the machine spindle and then locked in position by the clamp screws shown.

The method of setting is as follows: The holder and adapter are mounted in the turret and all screws and bolts loosened. A standard bar is chucked true with the spindle and the turret moved up so the adapter slips over the bar. The holder can then be locked in position by tightening the screws and bolts. A hole through the adapter is provided for the supply of cutting lubricant to the reamer.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
$\frac{3}{8}$ to $\frac{33}{64}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{1}{16}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{5}{16}$	$\frac{1}{4}$–20	$\frac{1}{8}$	$\frac{1}{16}$	3	6	$\frac{3}{16}$	$\frac{19}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{3}{8}$	0.552	$\frac{1}{4}$
$\frac{3}{4}$ to $\frac{47}{64}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{1}{16}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{3}{8}$	$\frac{1}{16}$–24	$\frac{1}{8}$	$\frac{1}{16}$	3	6	$\frac{3}{16}$	$\frac{23}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{3}{8}$	0.740	$\frac{1}{4}$
$\frac{7}{8}$ to $\frac{31}{32}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{1}{16}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{7}{16}$	$\frac{1}{16}$–24	$\frac{1}{8}$	$\frac{1}{16}$	3	6	$\frac{3}{16}$	$\frac{27}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{3}{8}$	0.740	$\frac{1}{4}$
1 to $1\frac{3}{32}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{3}{32}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{1}{2}$	$\frac{3}{8}$–24	$\frac{1}{8}$	$\frac{3}{32}$	3	6	$\frac{1}{4}$	$\frac{31}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{1}{2}$	0.990	$\frac{5}{16}$
$1\frac{1}{4}$ to $1\frac{7}{32}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{3}{32}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{9}{32}$	$\frac{3}{8}$–24	$\frac{1}{8}$	$\frac{3}{32}$	3	6	$\frac{1}{4}$	$1\frac{3}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{1}{2}$	0.990	$\frac{5}{16}$
$1\frac{1}{2}$ to $1\frac{11}{32}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{3}{32}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{5}{8}$	$\frac{7}{16}$–20	$\frac{3}{16}$	$\frac{3}{32}$	4	8	$\frac{1}{4}$	$1\frac{7}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{1}{2}$	1.240	$\frac{5}{16}$
$1\frac{3}{4}$ to $1\frac{13}{32}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{1}{8}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{11}{32}$	$\frac{7}{16}$–20	$\frac{3}{16}$	$\frac{3}{32}$	4	8	$\frac{1}{4}$	$1\frac{13}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{1}{2}$	1.240	$\frac{5}{16}$
$1\frac{7}{8}$ to $1\frac{23}{32}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{1}{8}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{3}{8}$	$\frac{1}{2}$–20	$\frac{1}{4}$	$\frac{3}{32}$	4	8	$\frac{5}{16}$	$1\frac{13}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{1}{2}$	1.240	$\frac{5}{16}$
$1\frac{7}{8}$ to $1\frac{31}{32}$	$2\frac{1}{2}$	$\frac{7}{8}$	$1\frac{3}{8}$	$\frac{1}{8}$	$\frac{3}{4}$	$1\frac{1}{4}$	2	$\frac{13}{32}$	$\frac{1}{2}$–20	$\frac{1}{4}$	$\frac{3}{32}$	4	8	$\frac{5}{16}$	$1\frac{13}{32}$	1	$\frac{5}{8}$	$1\frac{5}{8}$	1	$\frac{1}{2}$	1.240	$\frac{5}{16}$

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

April 12, 1923

Overhead and Burden

IT MIGHT seem that the little word between the two larger ones should have been *or*, not *and*, for to many people overhead and burden are synonymous. And yet there is a difference which should not be overlooked. Overhead is a necessity, just as much as material and labor. Burden should be wiped out, root and branch, if possible.

A large percentage of overhead may be an indication of up-to-date methods and excellent management. A large percentage of burden is a condemnation of the system and the manager. Overhead may be a useful servant—though it is not always such. Burden is a parasite. The tendency of modern manufacturers is to increase the overhead, which is merely another way of saying that labor cost must be reduced. Plant, equipment, management, system must take the place of direct labor to the fullest possible extent, and this means that the percentage of overhead rises. Even the cutting out of useless material increases this percentage, simply because the other costs have been reduced.

The overhead of a plant may be too high, in which case it should be brought down, but the mere fact that it is high does not prove anything. Cutting down overhead must be done with caution and discrimination. On the other hand, burden is a nuisance and should be killed if possible.

It might be asked what the difference is between the two. We would say that overhead in a manufacturing plant is all the expense, outside of direct labor and material, necessary for the carrying on of the operations. Burden comprises those expenses which have no bearing on the processes of manufactures. Building, plant, supervision, light, heat, power, taxes, trucking and handling are all necessary expenses. Without them manufacture would cease. Even insurance belongs to the overhead because it guarantees the existence of the business in case of accidents.

On the other hand the extra cost due to bad castings or hard material or a change in design of the product is a burden on the shop. Changes of design may be necessary in order to sell the product, and the cost may be a legitimate expense for the company as a whole but a burden so far as the manufacturing department, the shop, is concerned. The cost should not be loaded on the shop, but on the sales department or on the general management. The other items, bad castings, hard material and such should be killed off.

Overhead has a bad name, largely, perhaps, because it is confused with burden. There is as much difference between the two as between paying the grocer and the doctor.

Lack of Standard Practice in Railroad Shops

THERE is perhaps no better example of lack of standard practice on railroads and in railroad shops than in taking care of the wear on driving boxes and wheel hubs due to the lateral pressures on curves. Materials used for hub liners on driving wheels and the wearing surfaces on the driving boxes afford about as much variation as can be imagined.

Hub liners in the wheel include babbitt of all grades; good bronze rings and linings cast in place of the poorest scrap to be had; rings of boiler plate, rings of low carbon steel, of cast iron and of vanadium steel hardened and ground. There are also many ways of fastening the rings in place and in one road at least the hub liner is not fastened but floats in the hub.

The handling of driving boxes does not vary quite so much but there are good, bad and indifferent methods and details.

This is one of the problems which is practically the same on all roads. All roads have curves which produce wear between the driving box and the hub of the wheel. Such wear is bound to be much worse on some roads than on others owing to the local conditions, but it should not be difficult to find which method is most economical in resisting wear.

It might not, of course, be economical for the road with few curves to go to the expense of a method found necessary on very crooked roads. But first cost should not be the only consideration. Keeping the locomotive in service is far more important.

It would seem as though here is a case where it would be easy to arrive at a standard practice for all railroads or that at most two methods could be made to take care of both straight and crooked roads. A conference which would give facts as to results obtained and as to costs, should make it easy to decide on a standard practice. Once a start was made other standardization would follow with far less resistance to be overcome.

Knowing the Problems Of Your Selling Force

THE SALES manager who sits in the office and never visits his men in the field, never studies their problems as they actually are, but who expects uniform results from all territories, never makes a howling success. He is in reality only a set of rules and not a real manager at all. Real management must consider varying conditions, must study and take advantage of different localities and personalities and when occasion demands must change or break rules which are meant for regular routine business.

The farther the salesman or dealer is from the home office the more he needs the inspiration of an occasional visit by the real men from the main office. Letters are frequently unsatisfactory and little things which cause misunderstandings when the writer is a stranger, are harmless when you really know what kind of a fellow he is. You know that, no matter how it may sound on paper, Jones or Smith is a good scout and that he didn't mean anything which was unfair to either side.

The Pacific Coast territory is a case in point. Practically without exception, dealers in machine tools raise a unanimous appeal to builders of the machines they sell to visit the coast and study the situation at first hand. In no other way can the man who is accustomed to selling machines in dozen lots to larger motor factories, realize that a single sale may require a thousand-mile trip. Those who are accustomed to the short distance in the East can hardly appreciate that the distance from Los Angeles to San Francisco is 450 miles, and that from San Francisco to Seattle is twice as far. At the same time the entire population of the west coast states is less than that of New York City alone.

These conditions affect sales in a variety of ways which can only be appreciated by personal contact with them. Meeting your representatives and their problems face to face is a necessary part of successful selling. Whether you change your selling methods or convince your men that no change is necessary is immaterial. The main thing is to know the situation exactly as it is and to make personal contact with the men who represent you to the users of your machines.

Make up your mind to visit this section of the country at least once—and you may find it easy to form the habit. For, while east may be east and west may be west, to paraphrase the well-known poet, the sooner and oftener they meet the better for all concerned.

Convincing Proof That It Pays To Put the Cards on the Table

FOR MANY years the *American Machinist* has preached the doctrine of fair play to employees and urged that they be told the why of management problems. Occasional instances of the successful application of these principles come to light but not often enough to warrant a belief that a strong movement in the direction of real progress is under way.

One of these cases turned up at the recent conference of the business paper editors in Middletown, Ohio, where the addresses made by the vice-president of the American Rolling Mill Company and by some of his assistants showed a record of achievement in securing satisfactory industrial relations that was an eye-opener to most of the editors present. For nearly twenty years the officers of the company have presented their balance sheet to the advisory committee of employees, elected by the men in the plant, and have taken all the time necessary to give a thorough explanation of every move.

Such a proceeding would be an utter failure if it were attempted before steps had been taken to secure the complete confidence of the men in their company and its management. That it has been successful in Middletown is pretty good proof that this confidence exists there. Further proof is found in the fact that the American Rolling Mill Company has never had a strike.

Other phases of the industrial relations in this Middletown plant might be mentioned but enough has been said to show the possibilities in open and above-board dealing. We urge any employer who is not satisfied with conditions in his own plant or community to take a trip to Middletown and see how they do it.

Enforced Use of Goggles and Safety Devices

IT IS quite a common occurrence to hear shop managers complain that it is impossible to get workmen to wear goggles while grinding and chipping or to use other safety devices which are required by law. This is rather a difficult problem in several ways, as the enforcement of such rules involves unpleasant discipline in the way of fines or even discharge.

Where a plant has shop committees, the matter may very well be turned over to them for enforcement as it directly affects the cost of the mutual aid insurance which usually prevails in such shops. Logically, however, the enforcement of such laws is a state function.

The laws are proclaimed by the state and the employer must provide the safeguards required. The state sees through its inspector that he does so or he pays the penalty. Refusals to use such safeguards should be punished in the same way as failure to provide them.

In several states failure to use safeguards subjects the workmen to a fine or imprisonment or both. Of course we shall hear the howl about it being an infringement of personal liberty but every law does that. So far as results are concerned, it matters little whether a man loses his eyesight from a failure to wear goggles or from drinking bootleg whiskey. If the state has the right to prescribe safety devices, it has the right to insist on their being used to protect the state or community from the cost of supporting those who are crippled or disabled through their negligence to use safeguards which are provided.

In self protection and for the good of their families, men should be willing to wear goggles even if they are not altogether comfortable. If they are not willing, they should be compelled to wear them when necessary. Employers, personnel workers, labor unions and all other workers should urge the passage of the laws needed to enforce the wearing or using of such safety devices as the state requires to be provided for the safety of workers. It is not a function of shop management but of the law enforcing bodies of the state.

German Comment on the Work of the A.S.M.E. Plain Gage Committee

IN THE November 25 issue of *N.D.I.*, the organ of the German Standardization body, is an article commenting on the progress report of the A.S.M.E. Plain Gage Committee which was published in the *American Machinist* last July. It is interesting to note that although different bases of fits have been chosen by the German and American committees, hole and shaft tolerances show close agreement.

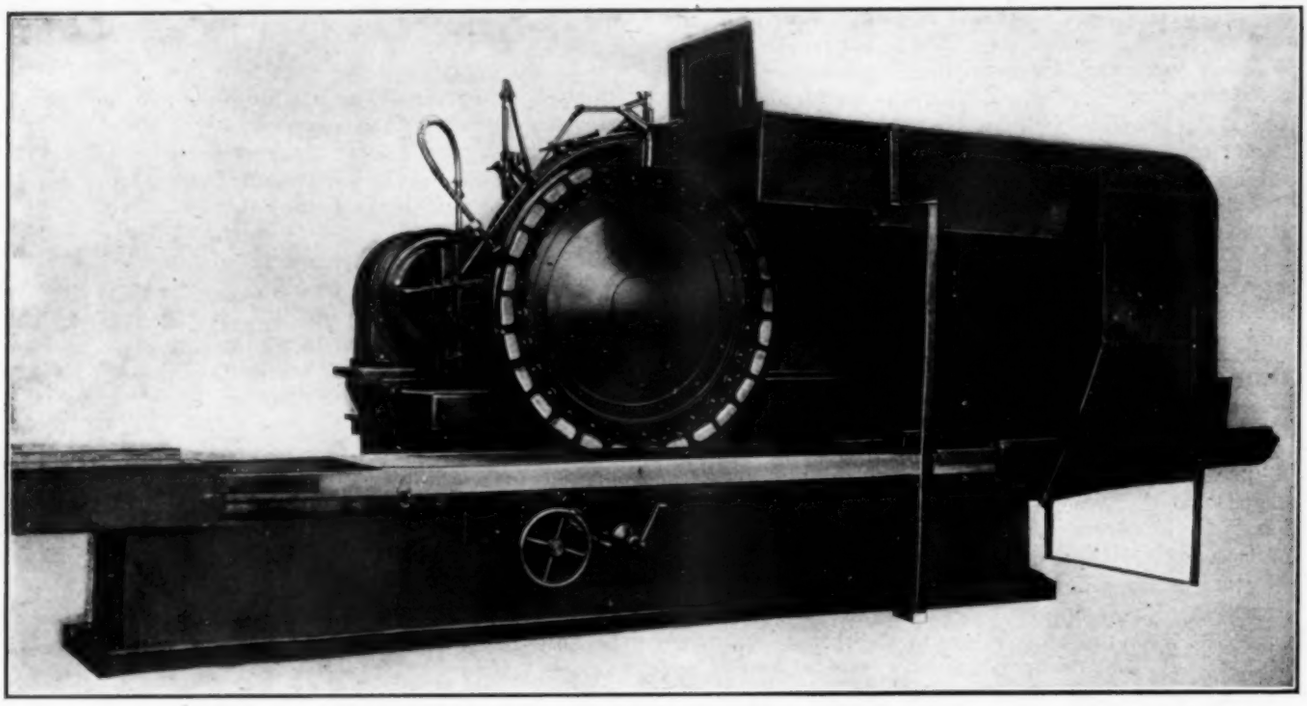
The German committee naturally believes that its method of building up a system of tolerances on "fit units" is superior. From a theoretical standpoint this opinion may be justified but from the practical point of view the much simpler American system is certainly more efficient.

The fact that such close agreement can be reached by two entirely independent organizations encourages one to believe that international standardization is within the bounds of possibility.

Shop Equipment News

Diamond 66-Inch Face-Grinding Machine

The Diamond Machine Co., 9 Codding St., Providence, R. I., has recently brought out an extra-heavy-duty face grinding machine similar to the one described on page 334, Vol. 53 of *American Machinist*. The machine is designed particularly for grinding large work such as boiler sections up to 60 in. in height.



DIAMOND 66-INCH FACE GRINDING MACHINE

The abrasive wheel, as shown in the illustration herewith, is of the sectional type and is 66 in. in diameter. It consists of 28 separate blocks of 2-in. face and 7¼ in. depth, each held rigidly in a chuck. It is claimed that the design of the chuck will allow the use of 90 per cent of the abrasive material in the blocks before it is necessary to replace them. A wheel dresser built on the machine can be used while the unit is in operation without stopping production.

A large cutting power is available on the face of the machine because a driving motor of 75 hp. is used and a large amount of kinetic energy is stored in the heavy rotating wheel, chuck and spindle. The drive from the motor to the wheel is by means of a Morse sprocket and silent chain, and it gives a speed of 180 r.p.m. to the wheel. The wheel spindle has a maximum diameter of 9 in. and is provided with large bearings for both radial and thrust loads.

A feature of the machine is the provision made for handling the coolant. An automatic system is provided for pumping the solution from a 140 gal. tank of large area at the rear of the machine. The tank receives the coolant after it has passed the wheel, settles out the solid material and allows the clean solution to be circulated again. Two large nozzles deliver an easily adjusted supply of cutting solution to the wheel. Sheet metal guards are provided to prevent splashing and to protect the bearings of the machine.

The traveling table for passing the work across the rotating wheel has a platen 36x110 in. in size that is provided with numerous slots by which fixtures and work may be attached. It has a speed of 22 ft. per min. The motion of the table is controlled by means of lever arms either at the front of the machine or at the operator's position behind the table. An arrangement of belts and pulleys within the bed of the machine reverses the motion of the table in such a manner as to give but little shock. The total weight of the machine is over 40,000 pounds.

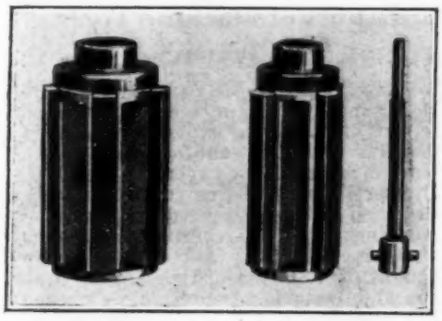
Foster-Johnson Hone for Automotive Cylinders

The Foster-Johnson Reamer Co., 1112 Beardsley Ave., Elkhart, Ind., has added to its line of products a cylinder hone that may be driven by an electric drill or any similar device. The tool is designed for repair shops and garages as a finishing and polishing device for automotive cylinders which have been previously reamed to a size to fit the oversize pistons.

The body of the hone is made of aluminum. On the smaller hones four abrasive stones are mounted lengthwise equi-distant from each other around the body, as shown in the accompanying illustration. The larger ones have five stones. These stones are mounted in slots in which are set springs that bear against the backs

of the stones and provide adjustment and resiliency. At each end of the slots are collars which limit the outward movement of the stones and act as retainers.

The driving power is obtained by means of a shank which is interchangeable between the various sizes of hones and which is held in the chuck of the spindle driving the device. One of these shanks is shown in the illustration herewith. The honing process requires from 1 to 3 min. per cylinder after the latter has been reamed to size. The operation consists simply of the slow movement of the hone up and down while it is rotating within the cylinder. It is claimed that a very high finish can be



F-J CYLINDER HONES AND SHANK

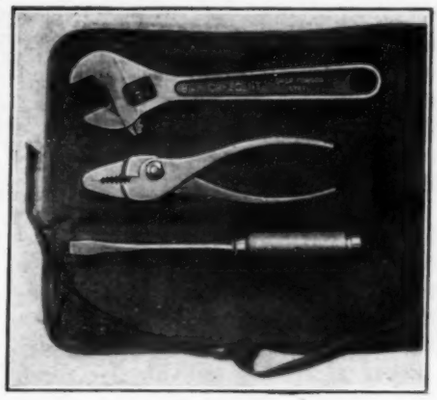
produced and an accuracy to within less than 0.0005 inch.

The F-J cylinder hones are made in seven sizes whose minimum diameters range from 2¾ to 4¼ in. Each size can be enlarged ¼ in. in diameter.

Crescent Tool Kit

A tool kit consisting of a wrench, pliers and screwdriver has recently been marketed by the Crescent Tool Co., Jamestown, N. Y. The outfit, which is illustrated herewith, is intended for general use, particularly in the household or on an automobile.

The wrench is made of drop forged steel. It is 8 in. in length and has an adjustable head with a maximum opening of 1⅛ in. A feature of the 6 in. pliers is the long straight nose. The screwdriver is 7½ in. in length with a ⅜-in. blade, and has a handle which may be swung and locked into a position at right angles to the shank to give more leverage. It is claimed that three times the power of the ordinary screw driver can be applied by the hand when the handle is in this position. When locked in the T-position, the overall length is approximately 6 inches.



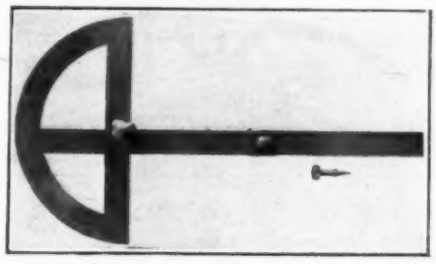
CRESCENT TOOL KIT

The complete kit is packed in a brown duck container, which folds into so small a space that the whole unit can easily be carried in the pocket or the side pocket of an automobile.

Golden Combination Drawing Instrument

The feature of the combination drawing instrument recently placed on the market by the Golden Compass Co., Elkhart, Ind., is that the rule, pivot point and zero mark on the protractor or half circle are all in line, and thereby make it possible to "short cut" many drawing operations.

The instrument, as shown in the illustration herewith, combines a protractor, T-square, rule and compass all in one. The protractor is graduated to ½ deg.; the T-square has a cross bar which is graduated to 1/32 in. on one side and 1/64 in. on the other; and the rule is 6 in. long and is



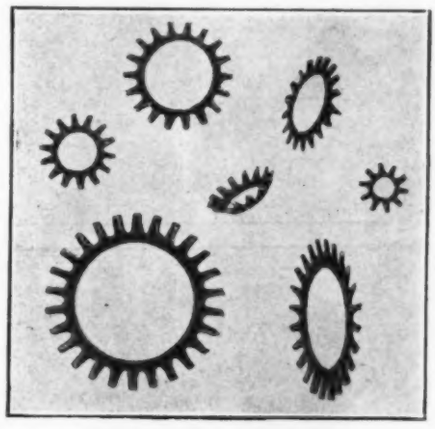
GOLDEN COMBINATION DRAWING INSTRUMENT

scaled to 1/32 in. on one side and to 1/16 in. on the other. A compass is provided by the use of an adjustable pivot point, one of which is shown in the illustration separately, and an adjustable slide on the rule that holds the pencil point.

The pencil point is pressed down when drawing circles and angles and released for other work. The pencil slide can be removed and is provided with a setscrew to hold the pencil point in position when drawing circles.

"Shakeproof" Lock Washers

The accompanying illustration shows a number of lock washers of varied sizes that have recently been placed on the market by the Shakeproof Screw & Nut Co., 400 N. Michigan Ave., Chicago, Ill. The washers, it is claimed, will lock screws and bolts of any material from aluminum to tempered steel, and are intended for use on trucks,



"SHAKEPROOF" LOCK WASHERS

automobiles, pneumatic tools, gasoline engines and similar devices on which excessive vibration takes place.

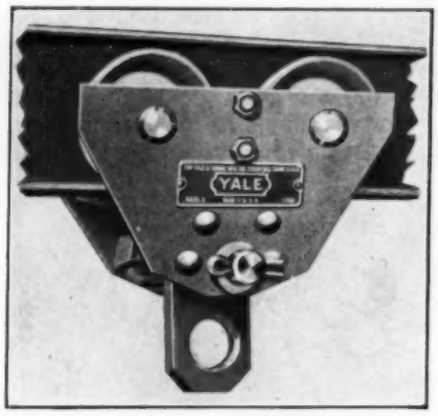
The washers are made of clock-spring tempered steel and are rust-proofed. The flat washers range in size from ⅛ to ¾ in. nominal inside diameter and have from 10 to 32 locking struts, depending on the size. These struts or teeth are set at an angle of 45 deg. and under pressure they tend to flatten to about 20 deg. It is claimed that the more the vibration, the greater the hold, because the pressure gradually enmeshes the tops and bottoms of the struts with the nut and underlying material and produces a permanent hold.

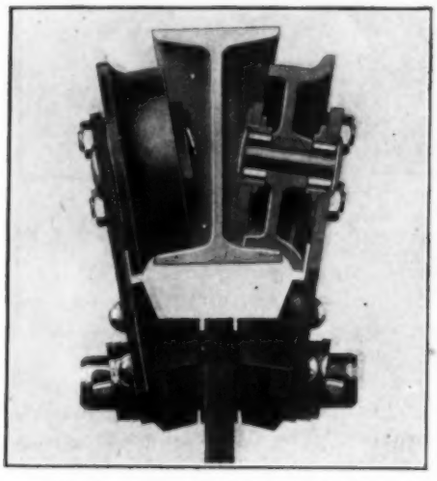
Countersunk lock washers of the type shown in the center of the illustration are also made ¼ in. in inside diameter with 14 struts for locking ¼-in. flathead machine screws, stove bolts or other screws or bolts with countersunk heads. Additional sizes of both flat and countersunk lock washers can be supplied on order to suit the work.

Yale Steel-Plate Roller-Bearing Trolley

Strength and flexibility are the main features of the Yale steel-plate roller-bearing trolley shown in the illustrations herewith, and recently built by the Yale & Towne Manufacturing Co., Stamford, Conn.

A reserve strength of seven times its rated capacity enables the trolley





YALE STEEL-PLATE ROLLER-BEARING TROLLEY

to withstand great shocks and strains. It is claimed that under test a 2-ton trolley withstood a load of 28,000 lb. Combined with this strength the trolley possesses flexibility because the non-rigid construction permits each wheel flange to take a position suited to the curve of the I-beam flange. It is said that binding is eliminated even around a curve of sharp degree, so that a 1-ton trolley will run easily on a 21-in. minimum radius curve.

The trolley has four wheels with chilled-iron treads which conform to the shape of the I-beam flange, as may be seem from the illustration. The hardened treads increase the life of the wheels due to the resistance the surface offers to wear. The wheel axles are set parallel to the angled surfaces of the I-beam flange, are pressed in the wheel-hubs and are supported by an inner bearing plate. Bending strains on the axle are largely eliminated by the arrangement.

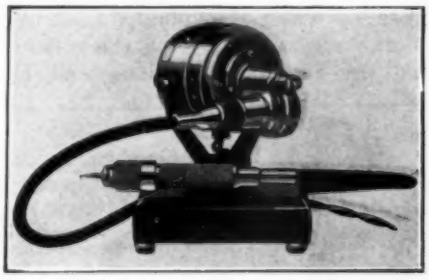
The axles are mounted on heat-treated, hardened and ground cylindrical roller bearings. The latter are fitted in side plates which are connected together at the bottom by a single cold-rolled steel equalizing pin. Either a shackle, eye or clevis can be supported by the pin, and where small head-room is required the chain block can be hooked directly over the equalizing pin.

Each side plate has spreader castings riveted to it. These castings provide a large bearing surface for the equalizing pin, and are so shaped as to protect the trolley and act as a bumper which engages the track-stop on the lower flange at the end of the I-beam track.

"Dumore" Geared Flexible-Shaft Utility Tool

The motor-driven flexible-shaft utility tool shown in the illustration herewith is a recent product of the Wisconsin Electric Co., Racine, Wis. It is intended for delicate drilling, engraving and die-sinking work, and is sold under the name of "Dumore."

A feature of the tool is the aluminum hand-piece. It is fitted



"DUMORE" GEARED UTILITY TOOL

with a double row of S.K.F. ball bearings, which take up the end thrust and radial load and give the chuck a smooth running motion. It is claimed that the hand piece will not heat up under continuous service.

A No. 0 Jacobs chuck is used with ground gripping points on the chuck jaws. The chuck will hold tools from $\frac{1}{4}$ in. down to a No. 80 drill and rotates at speeds from 500 to 2,000 r.p.m. The speed is controlled by a 5-speed rheostat in the base of the unit. A brass chuck guard is provided that is removable from the hand-piece by a single turn. This guard permits the hand-piece to be gripped close to the work.

A nickle-plated motor which operates on either alternating or direct current supplies the motive power to the tool by means of a worm and gear drive, which reduces the speed. The motor pivots in brackets that are attached to the base.

A No. 7 S. S. White hand-piece with a special adaptor and coupling can be supplied, and a foot controlled rheostat can also be furnished.

Export of Machine Tools In January

Interesting data is furnished by the Department of Commerce by the recent report on domestic exports of various machine tools by manufacturers in the United States to all parts of the world. During January of this year there were exported 1,396 sharpening and grinding machines of all descriptions. Of this number, England took 250, Canada bought 353, the majority going to Quebec and Ontario, Argentina purchased 171 and Japan 126. The total valuation is placed at $70,233 for all sales to foreign countries of these tools.

There were sold by export during January emery and corundum estimated at 152,870 lb. at a value of $58,946, the largest amount going to France that purchased 32,974 lb. England bought 21,362 lb., and Japan 13,770 lb.

Artificial abrasives to the value of $49,624 were exported, England being the leading purchaser with 39,028 lb. ordered and Canada a close second with 34,292 lb. bought. The total number of pounds exported during the month was 146,446, according to the figures.

Metal-working machinery was also exported in considerable volume during the first month of the year. Thread-cutting and screw machines to a total valuation of $28,963 were exported, while bunching and shearing machines valued at $34,902 were shipped. Argentina was the leading buyer of thread-cutting and screw machines, taking 295, mostly of the cheaper variety, while Mexico ordered 20 medium priced machines and England took nine high priced ones.

Bending and power presses were exported during January to a limited extent, England, Canada, and Japan each taking four. The total valuation for this classification was placed at $23,205 by the report.

There were exported during January 1,323 chucks, centering machines, lathes, drills and other machines of this type. France proved to be the best customer for these, taking a total of 509, while England purchased 182, Quebec and Ontario 144, and Japan 130. The total valuation was $19,900. Reamers, cutters, taps and dies to the value of $123,418 were exported. Quebec and Ontario were the leaders with England second, France third, and Cuba fourth.

News Section

Increase in Locomotive Repairing Shown

Locomotives in need of repair on March 15 totaled 15,631, according to reports filed today by the carriers with the Car Service Division of the American Railway Association. This was an increase of 274 over the total on March 1.

Of the total number, 13,930 were in need of repairs requiring more than 24 hours, which was an increase of 507 over the total number on March 1. Locomotives in need of light repairs numbered 1,701, which was a decrease of 233 within the same period.

During the semi-monthly period extending from March 1 to March 15, the railroads repaired and turned out of their shops 16,841 locomotives, compared with 17,207 during the last half of February.

Iron and Steel Imports Break Record

During 1922 the imports of iron and steel aggregated 713,861 tons, according to reports recently issued by the Department of Commerce. This exceeded any previous year by several hundred per cent.

Details of the incoming shipments of iron and steel, expressed in gross tons follow:

	Dec. 1922	Year of 1922	Nov. 1922
Pig iron	54,728	383,445	98,767
Scrap	28,602	142,969	25,585
Ferromanganese	5,160	94,592	6,192
Ingots, blooms, billets, slabs and steel bars	1,760	27,719	2,007
Structural	1,447	7,823	3,055
Bar iron	1,170	80,809	2,113
Ferrosilicon	1,052	14,806	415
Rails and splice bars	911	26,628	1,377
Tin plate	347	2,682	33
Wire rods	277	1,725	120
Tubular products	265	879	308
Round iron and steel wire	136	648	230
Totals	96,082	713,861	140,512

Recent Inquiries from Railroads

The American Short Line Railroad Association, Railway Exchange Building, Chicago, is making inquiry for twenty-two locomotives, 1,306 freight cars, seven passenger cars, a large quantity of bridge material, relaying rails, turn tables, track scales, tanks and also the following machinery:

One engine lathe, 20 in. swing, 12 ft. bed, for rebuilding purposes—California delivery.

One wheel lathe—Louisiana delivery.

One wheel press, 200 to 300 ton capacity—Texas delivery.

The Elgin, Joliet & Eastern R.R. is in the market for machine tools to replace those destroyed in a recent fire. The Illinois Central has made some good sized purchases, but is reported to be in the market for additional machinery. The Chicago & Northwestern Ry., Rock Island, and Duluth, Mesabi & Northern R.R. also contemplate machine tool purchases. The Atlantic Coast Line R.R. has embarked on a program for expenditures of approximately twenty-six million dollars. Additional shop facilities and shop equipment are mentioned as some of the principal items, aside from ninety-one locomotives, 101 steel passenger cars, 5,331 freight cars, and rails. The Union Pacific has practically filled its requirements for machine tools.

Summer School at Carnegie

Courses to interest nearly anyone in need of technical training will be given this summer at Carnegie Institute of Technology, at Pittsburgh, according to a preliminary announcement. The variety of the subjects has been increased by the addition of many new courses, and special emphasis will be placed on these courses that have been outstanding successes of former years. The summer session is, of course, arranged primarily to fill the needs of teachers and under-graduates.

The Carnegie Summer School will open June 25 and continue for eight weeks until Aug. 17. Six weeks' courses will be conducted from July 2 to Aug. 10. The College of Fine Arts, the College of Engineering, the College of Industries, the Margaret Morrison Carnegie College, and the Division of General Studies are included in the summer program.

Decrease in Railroads' Earnings

Net earnings for February were $38,903,000, according to the report recently published by the American Railway Association. This is equivalent to 3.73 per cent on the tentative valuation and compares with a year ago February when the percentage was 4.67 and the earnings were $47,727,000. In January of this year the earnings represented 5.54 per cent of the tentative valuation.

The report for February indicates larger expenditures that have been made for equipment and repairs and by comparison 22 per cent more was spent this February than during February, 1922.

Southern Railway to Buy New Equipment

The Interstate Commerce Commission recently granted authority to the Southern Railway system to expend $12,300,000 for new equipment. The money will be raised by the sale of three series of stock: Series X on the Southern Railway, Series G on the Cincinnati, New Orleans & Texas Pacific Railway, and Series G on the Alabama Great Southern Railway. It is expected that purchases of equipment will be made within a short time.

British Engineers Get Large Gift

Civilization, according to engineers, is entering upon an era of scientific research destined to exercise a vast influence on the fate of nations. Following the $500,000 gift of Ambrose Swasey of Cleveland making possible the organization of the Engineering Foundation, comes news from London that Sir Alfred Yarrow has given the same amount to the Royal Society for the same purpose.

Sir Alfred's philanthropy, it was said at the national headquarters of the American Society of Mechanical Engineers in New York City, of which he is an honorary member, is another step toward the identity of effort which engineers and men of science are striving to accomplish throughout the Anglo-Saxon world.

The funds donated by Mr. Swasey, called the dean of the American engineering profession, are being applied, it was said in a statement just issued by the Engineering Foundation, "for the furtherance of research in science and engineering, or for the advancement in any other manner of the profession of engineering and the good of mankind."

Henry Dreses Is Given Farewell Dinner

The radial drilling machine manufacturers of Cincinnati gave a farewell dinner party to Henry Dreses on the evening of April 4, at the Business Men's Club.

Mr. Dreses had been so prominent in the radial drilling machine business and so highly respected by his competitors in Cincinnati that they felt it a pleasure to spend a social evening with him on the occasion of his retiring actively from the industry.

Each one present had something nice to say about him and at the close Mr. Dreses gave a sketch of his life and his many experiences, which was very much enjoyed by all.

August H. Tuechter acted as toastmaster, and on behalf of the gentlemen assembled presented Mr. Dreses with a beautiful Rookwood vase with the best wishes and love from his former associates.

Those present were the following:

J. B. Doan, American Tool Works Co.; J. C. Carlton, Carlton Machine Tool Co.; Oscar W. Mueller, Mueller Machine Tool Co.; Norman B. Chace, Fosdick Machine Tool Co.; George McG. Morris, Morris Machine Tool Co.; Arthur C. Pletz, Morris Machine Tool Co.; William Gilbert, Dreses Machine Tool Co.; Charles Gilbert, Dreses Machine Tool Co.; Walter Hudson, Dreses Machine Tool Co.; George P. Gradolf, The Cincinnati Bickford Tool Co., and August H. Tuechter, The Cincinnati Bickford Tool Co.

Want Power Show Name Expanded

A conference of the chairman of the Machine Shop Practice Division, P. O. Hoagland, with the following members of the Division present, was held in New York on Friday, March 30, at 10:30 a.m.: Erik Oberg, A. L. DeLeeuw, Ralph E. Flanders, Earle Buckingham, J. J. Reynolds, Wilbur J. Peets, Frederick Franz, J. W. Roe, chairman, Meetings and Papers Committee of the Council, W. E. Bullock (assistant secretary), C. E. Davies (assistant secretary, meetings) and C. B. LePage (assistant secretary, research and standards).

It was announced that two papers are available for the spring meeting, the first on Recent Developments of Balancing Machinery, by C. R. Soderberg, and the second on Machine Shop Practice in Paper Machinery Plants, by G. E. Williamson.

Topics for the annual meeting were discussed as follows: Application of Electric Motor Drives to Machine Tools, Sheet Metal Working, and Code for Testing Tool Steels.

After considerable discussion, it was voted to request the International Exposition Co. to extend the power show planned in connection with the annual meeting, to invite the chairman of the Machine Shop Practice Division to serve on the Advisory Board, and to change the name of the show possibly to the Mechanical Show, and to have it include machine tools and other machinery.

An all-round discussion developed a number of interesting and important topics which the division might take up, and the chairman was authorized to appoint a committee on plan and scope to give consideration to these topics. Among them was the subject of research, which it was felt might be developed through the Bureau of Standards. The chairman later appointed A. L. DeLeeuw, Erik Oberg, K. H. Condit, J. J. Reynolds, Earle Buckingham, Wilbur J. Peets, and Frederick Franz as this plan and scope committee.

Plans for Foreign Trade Convention

With registrations already received from twenty-one states and two foreign countries, plans for the New Orleans Foreign Trade Convention, May 2-3-4, are rapidly taking shape.

Emphasis will be laid on the importance of European markets to American foreign trade and prosperity. The opening session of the Convention will consider a report on "European Conditions Today," specially prepared for this meeting by a Committee of the National Foreign Trade Council.

In this same session, Dr. Jeremiah W. Jenks, Alexander Hamilton Institute, will discuss "European Progress during the Year." Some of the barriers encountered in trading with Europe will be described by W. F. Gephart, First National Bank of St. Louis, while methods of trading under abnormal conditions and in the face of depressed exchange, will be outlined by A. C. Kains, President of the Federal International Banking Co., New Orleans, La.

At the close of the Convention the new Inner Harbor-Navigation Canal at New Orleans will be formally opened. This canal connects the Mississippi River with Lake Pontchartrain, and transforms great tracts of interior lands into waterfront property, suitable for purposes of commerce and industry.

Delegates to the Foreign Trade Convention will be taken over the Harbor of New Orleans on May 5, prior to the formal opening, as guests of the Port Commission.

New Record in Pig-Iron Production

All monthly records for pig-iron production were broken during March, according to figures recently given out by the iron and steel companies. The total output was 3,512,275 tons which even exceeds the previous high record of 3,508,849 tons produced during October 1916—during the war.

The daily average production during the month was 113,590 tons, while in September 1918, the average daily production was 113,942 tons, but was made with 364 furnaces operating whereas during March the number of furnaces active totaled 296.

Unless predictions go wrong, the March output of steel will also establish a new high record. It has been pointed out that every furnace in the Pittsburgh district is in operation and that in western Ohio the furnaces are nearly all active.

Japan Proves Good Buyer of Machinery

Japan imported from the United States in February, according to a cable to the Department of Commerce from Commercial Attache Jas. F. Abbott, Tokio, goods valued at 39,000,000 yen, and exported to the United States goods worth 64,000,000 yen, giving a balance in Japan's favor for February of 25,000,000 yen, compared with a balance in favor of the United States in January amounting to 5,000,000 yen. Total imports from the United States in February were 6,000,000 yen less in value than in January, but a rather remarkable increase occurred in machinery imports, of which Japan took 5,100,000 yen worth, compared with 3,800,000 in January, an increase of more than 25 per cent. The increase in exports from Japan to the United States from 40,000,000 yen in January to 64,000,000 yen in February is accounted for principally by raw silk shipments.

Atchison Road to Sell Employees Stock

Announcements from W. B. Storey, president of the Atchison, Topeka & Santa Fe R.R., state that in the future stock will be sold to employees of the company on the partial payment plan. In order to obtain the stock it will be necessary to go into the open market from time to time, it is stated.

There are 71,000 employees of the railroad and many of these are anxious to buy stock, it is asserted. The company will be put to considerable expense by the trading but feels that it will be repaid in good-will.

F. M. Feiker to Organize World Surveys

At the request of Secretary Hoover, of the U. S. Department of Commerce, F. M. Feiker, Assistant to the President of the McGraw-Hill Co., Inc., has again been granted leave of absence to undertake the organization and general direction of the world surveys of raw material supplies, rubber, sisal hemp, and nitrates, for which Congress recently made an emergency appropriation of $500,000.

Mr. Feiker served as Assistant to the Secretary of Commerce during the first year of Mr. Hoover's administration, acting as general assistant in organizing the personnel and industrial trade contact committees in relation to the Bureau of Census, the Bureau of Standards, and the Bureau of Foreign and Domestic Commerce. Out of his nine months' work came the monthly statistical survey of the Bureau of Census, the Division of Simplified Practice of the Bureau of Standards, Commerce Reports in new form, and fifteen so-called commodity divisions of the Bureau of Foreign and Domestic Commerce. Of this latter work the Annual Report of Dr. Julius Klein, Director of the Bureau of Foreign and Domestic Commerce, said:

"The important task of carrying on this liaison work with the industries was under the general supervision of F. M. Feiker, Assistant to the Secretary of Commerce. Mr. Feiker's extensive experience and wide contact with industrial organization and individual manufacturers is largely responsible for the striking success which has accompanied this innovation in the organization of a government department."

Car Loading Continues at Record Pace

Record-breaking loadings for this time of year of revenue freight continue. The loading for the week which ended on March 24 totaled 917,086 cars. This was an increase of 79,795 cars over the corresponding week last year, and an increase of 230,469 cars over the corresponding week in 1921.

The total for the week also was an increase of 12,750 cars over the preceding week and was, with one exception, the largest for any week so far this year.

Loading of merchandise and miscellaneous freight, which includes manufactured products, totaled 559,319 cars, 10,744 above the week before. This was an increase of 112,622 cars above the same week last year, and an increase of 56,716 cars above the same week two years ago.

Compared by districts, increases over the week before in the total loading of all commodities were reported in the Eastern, Allegheny, Central Western, and Southwestern districts, while decreases were reported in the Pocahontas, Southern and Northwestern districts. Compared with the corresponding week last year, all districts reported increases except the Pocahontas, while the Southwestern district was the only one to report a decrease compared with the corresponding week in 1921.

With favorable weather during April, it is expected that each succeeding week will show a new record.

Machinery in the Extensive Northwest

BUSINESS conditions in the machinery trade are considerably different in the vicinity of Portland, Ore. and Seattle, Wash. than in California. The oil boom in the Los Angeles district has no duplicate elsewhere on the coast. But, as in all booms, there are drawbacks, some of which were mentioned previously.

Portland and Seattle depend more on the lumber and fishing trades, with irrigation a not-to-be forgotten factor. Lumber is the largest item and, now that business is good in that line, there is considerable activity in machine tools of various kinds. Every sawmill of any size has to have a repair shop and when it comes to the logging and lumber companies, they have shops which would grace a small sized railroad and the machine equipment is much better as a rule.

Logging operations require a lot of machinery these days. Donkey engines mounted on skids, usually of huge timber of say, 3x4 ft. and 50 ft. long, are used in great profusion. These require pulley blocks for the wire rope, located either on the ground for directing haulage, or at the top of a 200-ft. trunk which has been left for a "spar." These blocks vary from about 12 to 36 in. in pulley diameters, and in the modern roller bearing type, cost up to $600 and $700 each. All these mean machine tools for building and repairs. Then there are the locomotives that haul the logs out of the woods, or in some places large tractors of the crawler or track-laying type. Logging cars receive severe usage and add to the necessity of having ample repair capacity, and good equipment. For the most part, the machine tools are of well known standard makes.

Special Mills

Beside the logging and saw mills, there are special mills such as those for making doors and similar house trim. One mill which I visited turns out from 5,000 to 6,000 doors a day and has a well equipped machine shop. It is just about to order a 48-in. lathe and a machine for cutting gears for replacement in its wood working machinery. This gives a little idea of the way in which machine tools find their way into out of the way places in this country.

The fisheries, too, require a lot of machinery both for the cleaning and preparing for canning, and in the canning itself. The large can companies h ve local plants for this purpose.

Irrigation does not run into such large proportions but it is an important item.

The automobile repair shops must not be overlooked as a market for machine tools, for here—as elsewhere on the Pacific Coast—they are well equipped in a much greater percentage than in the places where the factory can supply parts in 24 hours. Cylinder grinders are common and it is not unusual to find two, and occasionally three, at work in a single shop. The investment in cylinder grinders alone in the Pacific Coast shops will total up to no mean sum. And these all mean a constant market for grinding wheels, not to mention new pistons and piston pins.

Shipbuilding is very quiet here as elsewhere and the tremendous liquidation which has taken place must be charged up to the cost of war. One might almost wonder whether it were cheaper from a financial point of view, to win or lose. Plants which were prosperous before the war and flourished like the proverbial bay tree during the war, have gone out of business in some cases. And their going has left its mark on the machine tool market in this vicinity in a way that only time can eradicate.

With the closing of the shipyards came the deluge of used machines which were thrown on the market in the endeavor to liquidate and get cash to meet expenses. Up to now this had been very largely a new tool market, but the lure of possible bargains seems to be just as strong for one sex as the other and men took the bait just as eagerly as the woman is supposed to do at the bargain counter. The prices were frequently high, as is often the case, but that is the history of most "bargains."

At the shipyards and logging camps in the busy seasons machines get constant and hard usage and used machines often are not sturdy enough.

Another bad feature was that used tools were bought beyond actual needs, in the thought that they were real bargains, thus practically closing the market for new machinery and in many cases for small tools as well. This, fortunately is now passing and there are signs of real activity in new machinery and in the best grades. It is no uncommon sight to find high grade lathes and milling machines tucked away in small repair shops, and, now that the general business conditions are better, there is little hesitancy in buying the best.

Another reminder of the cost of war is to be seen in the fleet of wooden vessels which cost millions of dollars, tied up in the basin just as they were three years ago. But, in spite of it all, business is coming back and there is a healthy tone in the machinery line. Seattle especially seems to be making real headway. Among the smaller industries is a concern making radio apparatus in competition with the eastern manufacturers. They have a good machine equipment and have built up an excellent reputation.

In spite of better business conditions, however, builders of machinery should not lose sight of the fact that sales conditions are very different from those in the East. Logging camps, sawmills and fisheries are not easily accessible and time, the great element in all sales costs, mounts up into days where hours suffice in the more thickly settled sections of the country.

It will be many years before the same conditions obtain as in the East and yet this is a market that is well worth careful study and consideration. For, in spite of scattered sales, the best estimates place the total machine tool market of the district supplied by Portland and Seattle at approximately $1,500,000. This is a somewhat surprising proportion of the estimated total of from $5,000,000 to $6,000,000 for the Pacific Coast states, and again emphasizes the advisability of machine builders taking the time to study the conditions at first hand. There is a marked change for the better in the past three years and every indication for steady, healthy growth without the doubtful desirability of a boom in the ultimate prosperity of this section. At this time of the year, the logging industry and fruit growing both get under way.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.0322	$0.0322	$0.0229
Cold finished shafting.....	per lb.....	0.0406	0.0406	0.0317
Brass rods.....	per lb.....	0.1913	0.1870	0.1533
Solder (½ and ½)	per lb.....	0.314	0.2833	0.20
Cotton waste..	per lb.....	0.1231	0.1181	0.104
Washers, cast iron (½ in.)...	per 100 lb.	4.50	4.33	3.83
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100.....	2.96	2.96	3.11
Lard cutting oil	per gal.....	0.575	0.5575	0.608
Machine oil....	per gal.....	0.349	0.349	0.40
Belting, leather, medium.....	off list.....	42%	49%	48½%
Machine bolts up to 1 x 30 in.	off list.....	48½%	51½%	64½%

Studebaker Corp. to Build Iron Foundry

The Studebaker Corp. has completed plans and will start work immediately on a new grey iron foundry at the South Bend, Ind., plant, to be erected and equipped at a cost of approximately $2,000,000. The building will be 720 ft. long and 680 ft. wide and will contain 570,000 sq.ft. of floor space. It will be equipped for a production of 45,000 lb. of castings an hour, or a total of 180 tons in an eight-hour day. The cupolas and other equipment will be so arranged that this capacity can be increased to 240 tons a day. With this increased capacity, all of the grey iron castings required by the corporation will be supplied from South Bend.

Orders for Locomotives Recently Placed

An order amounting to $2,804,200 for 27 locomotives has been placed by the Chesapeake & Ohio R.R. with the American Locomotive Co. and 25 more will be ordered soon, it was announced recently. An order for 10 Mallet engines has also been placed by the Denver, Rio Grande & Western R.R. The engines will be built at Richmond, Va., and Schenectady, N. Y.

New York Dealers Report Active Market

Actual buying of machine tools and machinery in the New York district is the rule at the present time, whereas previous to March, while there were many inquiries, buying was cautious and mostly to fill immediate needs. Reports from dealers state that the railroads are excellent purchasers and that impatience in delivery among these customers is also to be noted.

Dealers in used machines in New York report that the demand for the heavier type is not so marked except in the South and some parts of the Middlewest. In the South the buying is in greater volume than it has been during the past two years and good sales are reported from New Orleans, Texas, Birmingham and the mining districts of West Virginia. Dealers in used machinery state that New England and parts of New Jersey have proved to be fertile fields for obtaining machines, but resales have not been so easily made.

There is an active demand for machine tools in and around New York City with the inquiries rather equally divided between new and used tools. Shipyards and dry docks in the East are listed among probable customers this year and already good sized orders have been received from these sources.

Locomotive and car making shops have been excellent customers so far this year which is a reflection of the expenditures that are being made by all the railroads.

Optimism as to the future seems to prevail generally among New York City dealers and manufacturers and, unless some unforseen condition arises, no interruption of the present prosperity is anticipated for some little time.

Norton Employees to Get Paid Vacations

Approximately fifty per cent of the 2,200 employees of the Norton Co., Worcester, Mass., will receive one week's vacation with pay this summer, according to a recent announcement from the concern. Last year the same rule was in effect and proved to be so successful that it is being repeated this year.

To qualify for a paid vacation, the employee must have been on the company's pay roll for at least three years, but it is not necessary that this service be continuous.

Andre Citroen Addresses Society of Automotive Engineers

Andre Citroen, automobile manufacturer of Paris, lectured before the Metropolitan Section of the Society of Automotive Engineers in New York, April 6. His talk was illustrated by several reels of motion pictures showing the Citroen car, equipped with the Kegresse-Hinstin caterpillar propelling arrangement in place of rear wheels, crossing the Sahara desert.

The performance of the Citroen car is one of the most remarkable ever accomplished and the pictures show traveling of the most difficult kinds as a part of the day's work. Travel on the desert was for the most part over sand, but included some rock. Dunes were plentiful. In the pictures of certain tests the cars were shown crossing ditches, climbing mountains (grades as steep as 45 deg.), going through forests and bogs.

The Citroen cars used were 10½ hp. and averaged 15 miles to the gallon of gasoline, a consumption about three times that of the same car on four wheels. The bands on the caterpillar lasted for from 1,500 to 2,000 miles. Temperature conditions on the Sahara are particularly trying, with temperatures of 110 to 113 deg. F. during the day and 5 to 10 deg. during the night. A system of water conservation has been worked out which makes possible long travel on very little water.

Automotive Production Records Broken

During March, 346,383 motor cars and motor trucks were manufactured in the United States. This is the largest month's production in the history of the business, as it exceeds by 57,000 the record of 289,011 made in June, 1922.

Reports of shipments made at the directors' meeting of the National Automobile Chamber of Commerce held recently, also showed that the production for the first three months of this year, reaching 867,628, is more than double the same period in 1922.

Manufacturers believe that the three million mark will be reached. It is not expected, however, that production will go ahead as rapidly during the remainder of the year. It is believed that 3,000,000 is an outside figure for the 1923 output and this will depend on favorable conditions of the materials market.

Production facilities for the manufacture of closed bodies are inadequate to the demand and this is likely to prove a limiting factor.

The extraordinary sales of cars in the spring is expected to have its modifying influences toward a quieter condition after the first half of the year, although the popularity of closed cars has tended to stabilize the market for motor vehicles, creating an all-year demand. Closed car sales are averaging about 50 per cent of total.

Southwest Business Is Excellent

Railroads are still in the market to purchase machine tools with which to equip their new shops, and their activities are making business good in the Southwest at the present time.

A $50,000 building is being erected by the Armature Rewinding Co. at 3301 Washington Ave., St. Louis, to take care of the increased demand upon its business.

The Frisco railroad which has been a heavy purchaser for the past several months is contemplating the building of a new roundhouse, the site of which either has not yet been determined or is not being given out for other reasons.

With the receivership of the M-K-T. Railway being lifted it has announced an elaborate plan of improvements, much of which has already been started. The total amount expended and to be expended will approximate $47,000,000.

Machinery Sales Good in Chicago

Machine tool sales in the Chicago district during March were in larger volume than at any period during the last two and a half years. A large number of inquiries are being received daily. Although the railroads and automobile and kindred lines continue to do the bulk of the buying, parts for replacement on machine tools are being purchased steadily and in large volume by various other general manufacturers, indicating that their machines are seeing steady service. Second-hand and rebuilt machine tools are in strong demand, a majority of such purchases being made by the comparatively small manufacturers, many of whom first make inquiry for new machinery. One concern reports sale of a large order of machine tools for shipment to Japan.

Agencies of several machine tool builders report that sales are in such volume that deliveries are not promised before July.

The consensus of opinion among leaders of the machine trade in the Chicago district is that, if there is a general caution on the part of business men, the boom will not end in violent reaction. Rather it will slow down somewhat, and turn into a more modest kind of activity, which will last longer than the present feverish pace.

Railroads Plan Billion Dollar Program

A billion dollar program of improvements both in equipment, shops and trackage has been approved by the American Railway Association at the annual meeting recently held in New York City. Some of this money has already been spent and roads in every part of the country are ordering new equipment and repairing its old cars, it was stated. The Railway Executives Association also declared itself in favor of the continuance of railway operation under the provisions of the Transportation Act of 1920.

"The railroads of the country are raising this huge amount of additional capital," an announcement issued by the association states, "in reliance on the continuance of the policy announced in the Transportation Act, as a measure of reasonable protection to investment in railroad property."

From January 1, 1922, to date, it was announced at the meeting, orders for cars, locomotives, trackage and other facilities totaled $1,540,000,000. Of this sum, $440,000,000 had been expended in 1922, leaving expenditures of $1,100,000,000 to be made in the present year, exclusive of further orders for facilities the roads contemplate. The distribution of these expenditures is as follows:

	1923	1922
Cars	$515,000,000	$200,000,000
Locomotives	160,000,000	45,000,000
Trackage, etc.	425,000,000	195,000,000

A considerable part of the 1923 total had been ordered in 1922 for delivery this year. The expenditures for trackage and locomotives is estimated at only one-third the ultimate expenditure that will have to be made in order to get a full complement of supplementary facilities for the new cars ordered.

Replacements Imperative in Pittsburgh

A very good market for machine tools is developing in western Pennsylvania, several of the larger companies having inquired for lathes, planers, shapers and drill presses. With all the departments of the mills working at nearly capacity, there is a good deal of replacement necessary in machinery and machine accessories. It is believed that the labor situation has been drawn a little too fine and, as the spring comes on, it will be found that skilled men will be available to keep up the present operating rates of the finishing departments in the steel mills.

The plants in the Beaver Valley are particularly active, and several shipments of machinery have been made by the Standard Gage Steel Co., of Beaver Falls, Pa., whose line is cold drawn steel shafting, elevator guides, crank shafts, etc. Reports from the Union Drawn Steel Co., of the same place, are that many inquiries for shapes, shafting and special finished cold steel are turning into definite orders. The Moltrup Steel Products Co., also at Beaver Falls, has been working at close to capacity for a long time, and is shipping finished steel and machinery as fast as possible.

The iron and steel market is the most active that it has been in years and there is a good demand from machinery manufacturers for immediate deliveries. Even with the price advances that have come in the steel market quite frequently, dealers in Pittsburgh say that business is better now than at any time since the signing of the armistice. The incessant operation of the past twelve months has occasioned a wearing out of machinery that has been tolerated because of lack of time and opportunity to make replacements, but the time has come when replacement is imperative, and the orders placed with the machine tool dealers of this city reflect this condition.

Group Meetings Planned for Convention

Progress reports on the transportation study, now being made under the auspices of the Chamber of Commerce of the United States through the medium of a Transportation Conference, are expected to be presented during the Eleventh Annual Meeting of the National Chamber in New York, May 7-10.

The five special committees, representative of all interests in transportation and to which the elements of the problem have been assigned for accumulation of data and preliminary study, are already at work. They will report to a general committee, to be named later by Julius H. Barnes, president of the National Chamber. Action by the general committee to weld the reports into definite and comprehensive recommendations for a national transportation policy will not be taken prior to the Annual Meeting of the National Chamber, however, and discussion at the Transportation Group Session in New York will have to do with the progress then made by the special committees.

Arrangements for the Transportation Conference and also for the Transportation Group program at the New York meeting are in the hands of A. B. Barber, manager of the Department of Transportation and Communication of the National Chamber. As now planned, the program of the group meeting will merge into the work of the conference's special committees. At these meetings in New York, there will be afforded opportunity for discussion among transportation men of such aspects of the problems as the special committees have developed by that time.

News of Washington Activities

BY PAUL WOOTON

Orders for construction materials are pouring in upon manufacturers in such volume and the program of private building during 1923 has reached such proportions that many representatives of the industries affected have suggested recently that a conference be held to discuss the situation and lay the groundwork for co-operation to forestall the possibility of a runaway market for both labor and material.

Estimates, according to the Associated General Contractors headquarters in Washington, indicate a total building program of $6,000,000,000 under contract or contemplated for the present calendar year. This is $1,500,000,000 in excess of the total for 1922. The estimate includes all forms of construction, building and highway.

Reports to the Association as of March 1 indicated stocks of materials lower than on the same date last year, with producing plants having orders on hand to the limit of their capacity for several months to come.

At the same time, reports from practically all sections of the country showed demand for labor strong, common labor as well as skilled workers, with a tendency toward wage advances.

The indications of an exceptionally heavy demand for construction during the 1923 season has led representatives of many allied lines to give serious thought to means of averting a repetition of the conditions of 1920 and of assuring a continuity of construction and of employment.

Bitterness between nations is not always a bar to harmonious commercial relationships as is indicated by the report that German steel manufacturers, unable to furnish all of the orders which they have on their books, are allocating business to French manufacturers who are in a position to handle a much larger volume of business than is being offered them at present.

General Electric Shows Substantial Gains

The net income of the General Electric Co. for the year 1922, according to the annual report recently issued, amounts to $30,794,966 which compares with $28,155,667 earned during 1921. Orders received during the past year totaled $242,739,527, while during the year previous the orders amounted to only $179,721,680. Unfilled orders on the books at the end of 1922 amounted to $76,220,000 while at the end of 1921 the unfilled orders totaled $45,391,000.

There is every indication from business secured during the first quarter of the present year that a further substantial gain will be recorded.

Milwaukee Trade Shows More Activity

Partly as a reflection of the effect of difficulties in doing business through the greater part of March, owing to the worst storm period in years, and partly because demands upon manufacturers of metal products of all descriptions continue to increase steadily, machinery business in the first ten days of April has been gratifyingly active from the standpoint of Milwaukee jobbers and dealers. Manufacturers of machine tools and other production equipment occupy an improved position, although these shops are not yet working at capacity, especially in the case of milling machine builders. Much of the activity in this line is in the nature of a call for special multi-purpose types, rather than standard designs.

Considerable public garage construction is being done throughout Wisconsin and plans are coming out for many more to be erected as soon as outdoor conditions make it feasible to undertake building operations. These projects are absorbing a fairly heav· quantity of new as well as used tools of the lighter types and helping the used tool market rid itself of a surplus. In expanding capacity to meet larger needs, many metal trades concerns are buying used tools.

Automobile shops are still buying moderately of new floor equipment, although it is becoming more and more apparent that for the present the greater part of needs has been covered and future extensions of capacity will depend largely upon the progress which will be made in sales between now and July 1. The motor truck industry reports constantly increasing activity, but such shops have a long way to go, in most instances, before reaching maximum capacity of present establishments. The same is true of the tractor and power farm machinery trades, the call for tools from which is likely to be light and based mainly on replacements until conditions of supply and demand become pressing.

Connecticut Machinery Makers Busy

A canvass of representative Connecticut machinery manufacturers shows that they average much better than normal business, when conditions in 1914 are taken as a basis. The orders received by one machine tool manufacturer during March are 66 per cent of all orders received during 1922. The plant is running overtime with a full complement of men. Another of the machine tool manufacturers is operating at 60 per cent of present capacity.

One of the smaller plants, making a line of small tools, is running overtime. Another maker of small tools announces that business is improving. The small shops as a rule are looking up appreciably.

The manufacturer of a line of marine motors is working a great deal of overtime with a capacity crew. A manufacturer of printing and book binding machinery is working full time with a full quota of employees. The demand for special machinery is increasing, one plant visited being operated now almost to capacity.

Personals

R. D. LOVE, who has been manager of sales for the Warren Iron and Steel Co., Warren, Ohio, resigned that position to become vice-president of the Betz Pierce Co., Cleveland, iron and steel jobber. Prior to joining the Warren Iron and Steel Co., Mr. Love was connected with the United Alloy Steel Corp., Canton, Ohio, in a sales capacity. For seven years prior to 1918 he was connected with the Betz Pierce Co., to which he is now returning.

R. E. BEBB of Canton was elected chairman of the board of directors of the Central Steel Co., Massillon, Ohio, at its annual meeting recently. F. J. Griffiths was elected president; C. E. Stuart, first vice-president; J. M. Schlendorf and B. F. Fairless, second and third vice-presidents, respectively, and C. C. Chase, secretary.

C. K. STRAUSBAUGH of Sharon, Pa., is the new superintendent of the Standard Tank Car Co., Masury, Ohio, succeeding C. E. Neudorfer. Mr. Strausbaugh was formerly manager of the plant, retiring when Mr. Neudorfer took charge.

S. R. RECTANUS, who has been director of the personal service division of the American Rolling Mill Co., Middletown, Ohio, has been appointed assistant manager of the Ashland division of the company at Ashland, Ky.

J. C. WICKS, formerly district sales manager at Cleveland for the Brier Hill Co., Youngstown, Ohio, with R. G. MCKENZIE and E. M. UPDEGRAFF, both of whom were connected with the Brier Hill Co., now are members of the partnership known as J. C. Wicks and Co., Cleveland, to deal in iron and steel products.

W. C. RIELLY, general superintendent of the Youngstown Sheet and Tube Co., Youngstown, Ohio, and his assistant, E. T. MCLEARY, have been placed in charge of all the Brier Hill Steel Co.

JOHN M. WATSON, JR., until recently associated with the Cannonsburg Steel and Iron Co., Cannonsburg, Pa., is now affiliated with the sales department of the Ashtabula Steel Co., Ashtabula, Ohio.

F. H. MALONEY, formerly commercial agent for the Mississippi Warrior River Service, Chicago, has been appointed general agent for the railroad department of the Tuscon Steel Co., Youngstown, Ohio. His headquarters will be at St. Louis, Mo.

E. W. THOMAS, secretary to O. C. Skinner, works manager of the Standard Steel Works, Burnham, Pa., has been appointed assistant superintendent of the plant.

A. G. PIERCE will be the manager of the Pittsburgh office of the Central district of the Cutler-Hammer Manufacturing Co., Milwaukee. The offices in Pittsburgh after May 1 will be located in the Century Building. At present the offices are in the Farmers' Bank Building.

LOUIS W. WILLIAMS, formerly manager of the New York office of the Union Drawn Steel Co., has joined the organization of the Cauldwell-Wingate Co., New York City.

WILLIAM J. SLATER, former secretary and assistant treasurer of the Williams Foundry and Machine Co., Akron, Ohio, has resigned and is now associated with the Miller Rubber Co., Akron, in an executive sales capacity.

G. W. HUSTON is now in charge of the office of the Berger Manufacturing Co., Rochester, N. Y. Mr. Huston will specialize in building products.

C. A. DUNN, formerly sales manager for the Prime Manufacturing Co., has been appointed manager of sales for the Weldless Tube Co., Wooster, Ohio.

JOHN R. BALL, president of the Milwaukee Air Pump Co., Milwaukee, Wis., was the host to the Milwaukee Rotary Club recently at the company's new plant, 8 to 12 Keefe Ave.

ARTHUR BENNETT, general foreman of the locomotive department of the West Milwaukee shops of the Chicago, Milwaukee & St. Paul Railway Co., was elected Alderman from the Sixteenth ward of Milwaukee at the election on April 3.

WILLIAM H. ARMSTRONG, president of the Armstrong Foundry Co., Racine, Wis., manufacturing gray iron castings, was elected mayor of Racine at the spring election on April 3. Mr. Armstrong previously served several terms as mayor.

MILTON H. PETTIT, vice-president and general superintendent of the J. I. Case Threshing Machine Co., Racine, Wis., resigned April 1 to accept the position of vice-president in charge of operations of the Simmons Co., Kenosha, Wis.

GEORGE SATTERTHWAITE has resigned as vice-president of the Penn Seaboard Steel Corp. and the Tacony Steel Co. and will be associated with Henry Disston and Sons, Inc., Philadelphia. He will continue as a director of both the Penn Seaboard Steel Corp. and the Tacony Steel Co.

PAUL FROILAND, formerly works manager of the Ducksworth Chain & Manufacturing Co., Springfield, Mass., has organized the Froiland Chain & Manufacturing Co., Springfield, Mass. The company will engage in screw machine work and electric heat treating.

W. H. MARSHALL, chairman of the board of directors of the Consolidated Machine Tool Corp., New York, has been elected president to fill the vacancy caused by the sudden death of C. K. Lassister on March 3.

FRED C. STIENING has resigned as chief engineer of the Thomas Spacing Machine Co., Pittsburgh.

D. WINTHROP FOSTER has become associated with the J. P. Jones Mill Supply Co., Binghamton, N. Y.

BURT A. ROGERS will have charge of the iron, steel and machinery department that will be built by Charles Millar & Sons Co., Utica, N. Y.

ALBERT SCHAFFNER, formerly with the U. S. Navy Yard, Philadelphia, has become associated with the H. B. Underwood Corp., Philadelphia, maker of portable tools.

JAMES C. FERRIS has been named senior vice-president of the J. I. Case Threshing Machine Co., Racine, Wis., and will have charge of the new central division with headquarters in Chicago.

M. J. POWERS, formerly general machine shop foreman of the D. & H. R.R. at Oneonta, N. Y., has been made master mechanic for the Union Pacific Lines.

A. W. STEPHENSON, formerly with H. Bocker & Co., New York, has joined the organization of the Vanadium Alloy Steel Co., Latrobe, Pa., with headquarters in Philadelphia and New York.

HENRY A. PIERCE has been made manager of the Chicago territory for the Brown-Lipe Gear Co., Syracuse, N. Y.

M. J. CUNNINGHAM, for many years general manager of the Superior Corundum Wheel Co., Waltham, Mass., has resigned and will become associated with the Waltham Grinding Wheel Co., Waltham, Mass., as general manager.

FRANK A. SCOTT has been chosen vice-president of the Cleveland Engineering Society, vice-president C. M. Osborn having resigned. Mr. Scott is president of the Warner & Swasey Co.

G. S. PIERSON has resigned as manager of the Philadelphia branch of the Fairbanks Co.

C. V. PETERSON will become associated with the Brownell Machine Co., Providence, R. I. He was formerly a salesman for Hill, Clark & Co. in New England.

J. C. HOWE has been elected president of the American High Speed Chain Co., Indianapolis, Ind., to succeed G. G. Howe who has retired from active executive duties, although continuing as a member of the board of directors.

SANFORD DEHART will have charge of the personnel for the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, according to a recent announcement from the company. He will be assisted by H. E. ANTRIM as employment manager.

WILL H. MYERS will be the vocational training director at the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, assisted by JOHN STEPHENS as instructor in shop work. Mr. Myers was formerly with the Niles-Bement-Pond Co.

FRANK LANG has been appointed general superintendent of the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. He will be assisted by HAROLD LEBLOND and FRED STUTZMAN.

W. H. ALLEN has been promoted to the position of sales manager of the Kearney & Trecker Corp., Milwaukee, Wis. Mr. Allen has long been identified with the machine tool industry, having been connected with C. H. Besley & Co., Beloit, Wis., the Fellows Gear Shaper Co., Springfield, Vt., and since 1918 with the Kearney & Trecker Corp.

H. E. WITHAM has been appointed manager of the Chicago office of the Kearney & Trecker Corp., Milwaukee, Wis.

REGINALD CLARK has resigned as superintendent of J. H. Williams & Co., Brooklyn, and has joined the organization of the Western Forge Co., Marion, Ind. He is at present in England studying foreign forge practice.

WILLIAM DALTON will have charge of the new division of the General Electric Co. at Schenectady to be known as the General Plant Construction Division.

Business Items

The Worden-Allen Co., Milwaukee, Wis., structural steel fabricator and general contractor, has reorganized its official personnel following the retirement of Beverly L. Worden as president and treasurer. Eugene W. Krueger, who with Mr. Worden founded the company in 1902, has been elected president. William F. Kinsella, remains vice-president and continues in general charge of the sales department, and C. Martin, head of the general construction department, has been elected secretary and treasurer. Edwin F. Zuleger has been made assistant secretary and continues as general manager. The capacity of the plant, located on the Port Washington road, at the northern city limits of Milwaukee, is being increased. Orders have been placed with the Thomas Spacing Machine Co., Pittsburgh, for additional equipment valued at from $40,000 to $50,000.

Frederic B. Stevens, Inc., Detroit, foundry supplies and materials, which has maintained a Milwaukee sales office at 1350 National Ave. for several years, has been granted a charter in Wisconsin as a foreign corporation. The Wisconsin agent is Fred M. Weis. The application states that the total authorized capital stock of the corporation, which is organized under the laws of Michigan, is $500,000, and the proportion to be used in Wisconsin is $20,000. Arrangements are now being made to secure larger space for the warehouse and office.

The Oliver Machinery Co., Grand Rapids, Mich., will have three booths at the forthcoming Foundrymen's Convention and Exposition to be held in Cleveland, Ohio, April 30 to May 3. All of the company's products will be displayed and five representatives of the company will be in charge of the booth.

Dividends on common stock have been resumed by the Black & Decker Manufacturing Co., Towson, Md. It has been announced by the company that the quarterly dividend upon the preferred and the common stock has been declared.

The General Machinery Exchange, 211 Center St., New York City, has been reorganized under the name of the Broadway Machinery Co., Inc. The officers of the new company are: M. M. Rafkin, president; Morris Taff, secretary and treasurer. The company will continue to handle a complete line of new and used tools.

To take care of the increased business, The Western Iron Stores, Inc., Milwaukee, Wis., has increased its capital stock from $100,000 to $200,000. A branch has been established at Racine and one will also be opened at Green Bay, Wis. The concern deals in machine tools and woodworking machinery

The American Gear Grinder Co. has just located its factory at Benson St. and Bellevue Ave., Detroit, Mich. The concern has been incorporated by Albert J. Ott and his son Conrad L. Ott, formerly of the Ott Grinder Co., of Indianapolis, Ind., and active for the past five years in developing gear grinding machines.

The Hall Motor Truck Co., 907-913 West 19th St., Chicago, has incorporated with capital of $100,000. It will manufacture automobiles and motor trucks. The incorporators are Edward Graff, Robert G. Dreffin and L. Loewenstein.

The Instant Heating & Electric Corp., 357 West 63rd St., Chicago, has incorporated for $100,000 to manufacture and connect electric motors and mechanical specialties. The incorporators are G. A. Cook, J. Iva Hilyard, E. H. Dongremond.

A 500-ton concentrating plant being erected by the Wayne Iron Corp. at a cost of $400,000 for the development of iron ore deposits in Wayne County, Mo., is nearing completion and the company will start production July 1 at the rate of 200 tons of concentratives a day, according to Edward Belzbath, president of the company.

Dey Products Corp. of Buffalo, N. Y., has been incorporated for $150,000 to specialize in metal stampings. A factory will be leased and machinery installed at once. R. H. MacGregor, A. M. Dale, Jacob Tick, William Sandel, H. G. Ess, G. W. Wenz and F. G. Brest are directors.

The Iron Products Corp. reports operating earnings for the year 1922 of $1,001,823, according to the annual report recently filed. This compares with a loss of $791,425 in 1921. After the usual allowances and charges, each share holder receives $3.26 per share of common stock.

Bids on all plants of the Standard Parts Co., offered at auction in Cleveland, March 29, were refused by Receiver Frank A. Scott and his attorney as "too ridiculously low even to be considered." Mr. Scott said he will sell all Standard Parts properties not already disposed of at private sale.

The Oilgear Co., Milwaukee, Wis., maker of hydraulic presses, broaching machines, variable delivery pumps and variable speed drives, has appointed the Cleveland Duplex Machinery Co., Inc., Cleveland, Ohio, its representative in northern Ohio.

The Lacey Manufacturing Co., Inc., has moved into its new plant, 715 Union Ave., Bridgeport, Conn.

The foundry of the Taplin Rice & Clerkin Co., Akron, Ohio, was destroyed by fire recently. The loss is estimated at $275,000.

Construction work on the fifty coke ovens recently ordered by the Trumbull Cliffs Co., Warren Pa., from the Koppers Co., Pittsburgh, Pa., will be commenced immediately and it is expected that the work will be completed within a year.

Directors of the Sharon Steel Hoop Co., Sharon, Pa., were reelected at a recent meeting of the stockholders. They are Servan P. Ker, Harry T. Gilbert, T. P. Draper, George W. Short, A. E. Braun, J. F. Braun, J. F. Byers, J. R. McCune, Fred C. Perkins, L. W. Smith, William Krantz and C. L. Bradley.

The Combustion Engineering Corp., Ltd., and the Uehling Instrument Co., Paterson, N. J., have entered into an agreement whereby the Uehling interests in the Dominion of Canada and Newfoundland will be represented exclusively by the Combustion Engineering Corp. with principal offices located in Toronto, Montreal, Winnipeg and Vancouver.

Ten million dollars was wasted by industries in the United States last year because of lack of standardization of products, according to William A. Durgin of the U. S. Department of Commerce, who spoke at the three day spring meeting of the National Association of Brass Manufacturers.

The Port Colborne plant of the Canadian Furnace Co. will reopen during April.

The Barr and Creelman Mill and Plumbing Supply Co., Inc., has been incorporated and will deal in machine tools. The capital stock is $500,000.

Fire destroyed the blacksmith shop of the Pullman Co., 111th St. and Cottage Grove Ave., Chicago, recently. The loss is estimated at $200,000.

Obituary

SEABURY S. GOULD, aged 74 years, died recently in Auburn, N. Y. Mr. Gould was formerly the president of the Gould Manufacturing Co., Seneca Falls, N. Y.

ALFRED LUST, SR., auditor of the Huff-Daland Airplane Co., Ogdensburg, N. Y., died recently at his home in that city.

JOHN SIGWALT, president of the Sigwalt Manufacturing Co., Chicago, died recently at his home. Mr. Sigwalt was eighty-seven years old. He was well known in the steel business.

CHARLES SUMNER WILLIAMSON, formerly vice-president of the Mead-Morrison Manufacturing Co., Chicago, died recently at his home, in Chicago, following a short illness. He was a well known engineer, having specialized in ship-loading, ore and coal handling, and dock machinery early in his career.

WINSLOW BLANCHARD, president and sales manager of the Blanchard Machine Co., Cambridge, Mass., died April 7.

CLARENCE E. PLUNKETT died recently at his home in Rome, N. Y. Mr. Plunkett was a mechanical engineer and was formerly with the Thomas Morse Aircraft Corp., Ithaca, N. Y., and the Bemis Bros. Bag Co., Brooklyn.

JAMES M. SHANAHAN, New England representative of the Henry G. Thompson & Sons Co., saws and saw machines, New Haven, Conn., died recently at his home in Southington, Conn. Mr. Shanahan was 56 years old.

JAMES KIDD, aged 84 years, died recently at his home in Buffalo. Mr. Kidd was the inventor of many mechanical devices and improvements, including valveless steam cylinders, appliances for asphalt rollers and improvements for steel production. The Elliptic Spring Guard Co., maker of a new spring guard for automobiles, has leased premises at 2307 Webster St., Alameda, Calif.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

(Copyrighted. Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

THE BELATED figures of our foreign trade for the calendar year of 1922 were published last week. As against 1921, they show an increase of $603,000,000 in imports. The result is that the balance of trade in our favor was reduced to $716,000,000. This compares with an excess of merchandise exports over imports of $1,976,000,000 in 1921 and an average excess of over $3,000,000,000 annually for the preceding six years beginning with 1915 and ending with 1920.

No report of imports for 1923 has yet been published, but the exports for January and February aggregate $649,000,000. This compares with a total of $529,000,000 for the same months in 1922, but as the custom duties collected on imports are running far ahead of any previous record it seems possible and in fact probable that our imports for 1923 may equal if they do not exceed our exports. If the latter shall prove to be the case, it will be the first year since 1873 that the balance of trade has been against us.

This is a profoundly important contingency and one that has apparently been lost sight of because the tardiness of the department of commerce in publishing the returns and its failure to report imports and exports concurrently have confused the public.

It is true that we have been repeatedly told that it was inevitable that our imports would exceed exports now that we have become a Creditor Nation, but a balance of trade in our favor has been so long associated with prosperity in the public mind that it is to be feared that if the one disappears the other will vanish also.

For it must be remembered that our material resources and the energy required for their development are always at our call, the chief difference between good times and hard times being that in good times confidence inspires the activity which ceases when doubt halts enterprise and industry and causes hard times.

In time we may become accustomed to an equality of imports and exports and learn that it is the only basis upon which a sound and enduring foreign trade can be built. It will, however, be an anomaly in a country that was a debtor to the rest of the world prior to 1914 and we shall not become accustomed to it without some readjustments that may cause strain.

We will, for instance, probably begin to export some of the gold we accumulated during the war. Everyone knows we have more than our share of the yellow metal and in theory everyone is agreed that we ought to be rid of a part of it, but it is much to be feared that many bankers will have a chill when it commences to go out.

They know better than most that upon the broad base of more than half the world's monetary gold we have built up a credit structure that may become a little unsteady if part of its foundation is taken away and it is altogether likely that the unofficial threats of an advance in the rediscount rate have been inspired by an appreciation of such a contingency.

It may be that the softness of most speculative markets last week was due to a subconscious realization of the facts and possibilities thus pointed out. Lord Robert Cecil's speeches in which the menacing conditions that exist in Europe were so graphically described may have also had some effect. No one can exactly trace or apprehend the processes of the collective mind whose hopes and fears and conclusions are registered in the fluctuating prices of the market place. It is, nevertheless, a fact that the optimists have been less aggressive and that the pessimists have had less difficulty in making themselves heard.

> **"The jobbing business throughout the country is said to be excellent. The railroad officials look for a phenomenal summer traffic and are trying to prepare for it in the hope that by efficiency they may forfend a reduction in rates. The current business in the steel industry is extraordinary and big premiums are being offered for prompt shipment, although it is admitted that there is less demand for more distant deliveries."**

This is evident in the stock market, where prices are generally lower, as well as on the commodity markets where cotton, grain, sugar and coffee are dealt in for future delivery.

The change in the speculative psychology is all the more striking because all the routine indicia of trade show that an enormous business is passing. Bank clearings are large indicating a big distribution of goods. Montgomery Ward and Co. report an increase of 61½ per cent over last year in its sales for March and those of Sears Roebuck and Co. show a gain of 25 per cent.

The jobbing business throughout the country is said to be excellent. The railroad officials look for a phenomenal summer traffic and are trying to prepare for it in the hope that by efficiency they may forfend a reduction in rates. The current business in the steel industry is extraordinary and big premiums are being offered for prompt shipment, although it is admitted that there is less demand for more distant deliveries. Throughout the textile industry, North and South, wages have been advanced by from 10 to 12½ per cent and there is no unemployment anywhere.

The weekly report of the Federal Reserve System shows a gain of about $6,000,000 in the gold held and a reserve ratio of 75 per cent as compared with 75.5 per cent a week ago.

There is, therefore, no shortage of credit in sight unless it is factitiously created by an advance in the rediscount rate or a refusal to lend, and it may be that those whose caution has recently made them careful will before long yield to the persuasiveness of current trade statistics and recover their speculative optimism.

For it is becoming plain that in so far as the Washington administration is concerned it will use every agency of government to promote confidence and induce prosperity.

This is natural, not only because there is a presidential election in 1924, but because in a nation of business men, it is entirely proper that the economic welfare of its citizens should be the chief concern of its public servants.

Therefore, it is not surprising that the Secretary of the Treasury, the Secretary of Commerce and the Secretary of Labor should all be issuing optimistic bulletins and proclaiming that the glorious sun of our present prosperity will continue to shine for at least a year or two longer.

As against this view there are only three arguments worth considering.

The first is that the scarcity of labor and the high wages now demanded and paid will cause economic strangulation.

The second is that we may export gold and be thereby led to contract trade by contracting credit.

The third is that the seeds of international hatred and hostility that are now being sown in Germany by the French and in Poland by the Russians will germinate and produce another war that would so completely wreck civilization in Europe that even isolated America would feel the effect.

The probabilities are so nicely balanced that for the present at least they may be said to be in equipoise.

Officers Elected by Metal Trades in Chicago

At the 25th annual meeting of the Chicago branch of the National Metal Trades Association, the following officers were elected: Harold C. Smith, Illinois Tool Works, president; O. H. Strawbridge, Goodman Manufacturing Co., vice president; Charles A. Finkl, A. Finkl & Sons Co., treasurer. In addition to the president, vice president, and treasurer, the executive committee consists of Henry Beneke, Beneke & Kropf Manufacturing Co.; O. A. Olson, Simonds Saw & Steel Co.; L. A. Dolton, Weller Manufacturing Co.; Thomas S. Hammond, Whiting Corp.; F. A. Prahl, Continental Can Co., and William Ganschow, Wm. Ganschow Co. W. W. Coleman, Bucyrus Co., president of the national organization addressed the meeting.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Cement brick-making machine that is portable and hand operated. Mexico. Purchase. Quotations, c.i.f. Mexican port. Terms, cash with order. Correspondence, Spanish. Reference No. 5886.

Machinery for handling, ginning and pressing cotton. South Africa. Purchase and agency. Quotations, f.o.b. New York. Reference No. 5887.

Automatic machines for attaching snap-button on cards or cardboard, size of buttons, five, seven, eight and ten mm. Switzerland. Purchase. Terms, payment on receipt of machines or in advance. Correspondence, French. Reference No. 5888.

Machines for making carpets with knit wools. Uruguay. Purchase. Payment, letter of credit on New York bank. Reference No. 5889.

Small modern plant for the manufacture of paper bags for grocers, to be driven by electricity and include a suitable printing press. South Africa. Quotations, c.i.f. South African port. Terms, cash against documents. Reference No. 5890.

Machines for enameling and coating papers on the reel and machines for pasting several sheets together. England. Purchase. Quotations, f.o.b. New York. Reference No. 5891.

Machinery and appliances for contractors and general construction work. England. Purchase or agency. Reference No. 5892.

Clay mills capable of pulverizing clay into fine flour-like paste for pottery purposes. To be operated by electric power. China. Purchase. Quotations, c.i.f. Chinese port. Terms, cash against documents, in gold. Reference No. 5893.

Machinery for making machine-glazed tissue and wrapping papers, including beaters, digesters and calenders to make paper 210 cm. wide. Complete machinery for grey news board-making plant without dryers. Brazil. Purchase. Quotations, f.o.b. American port. Reference No. 5894.

The names and addresses of the following merchants will be forwarded upon request to the Philadelphia Commercial Museum, 34th below Spruce Street, Philadelphia, Pa. Requests should be made by number.

Textile mill supplies. Czechoslovakia. Correspondence in German. Reference No. 40,546.

Agricultural implements and machinery, water supply systems, pumps and pumping machinery, cement machinery, flour mill machinery, paper-making machinery. Bolivia. Agency. Correspondence in English. Reference No. 40,548.

Shoe making machinery. Argentina. Purchase. Correspondence in Spanish. Reference No. 40,549.

Agricultural machinery, sawmill machinery, machinery for making sugar cane liquors. Peru. Catalogs requested. Purchase. Correspondence in Spanish. Reference No. 40,559.

Machinery for producing starch from yucca or casava roots. Agency. New York City. Reference No. 40,560.

Sawmill machinery, woodworking machinery, stave making machinery. Venezuela. Correspondence in Spanish. Reference No. 40583.

Machinery for tannery and dyeing establishment. Italy. Purchase. Correspondence in English. Reference No. 40, 594.

Trade Catalogs

Grinding Machines. The New Haven Sherardizing Co., Hartford, Conn. Grinding machines and their parts are shown in a new catalog that has been issued by this company.

Idlers. Chillingworth Engineering Corp., New York City. The Melvin belt conveyor troughing idler which is constructed of steel and consists of three cold drawn steel idler pulleys of equal length and bearings is described in the recently issued bulletin No. 3-A.

Engine Lathe. Myers Machine Tool Corp., Columbia, Pa. The new Myers engine lathe with quick change gears is illustrated and fully described in a recent circular.

Conveying Systems. The .Chisholm-Moore Manufacturing Co., Cleveland, Ohio. The Atlas Carryall overhead conveying systems with both eight and four wheel trolleys are shown in a new catalog.

Conveying Systems. Chisholm-Moore Manufacturing Co., Cleveland, Ohio. Details of installation are shown for overhead conveying systems in a new book recently issued by this company.

Pipe Threading Machinery. Landis Machine Co., Inc., Waynesboro, Pa. Catalog No. 27 issued by this company describes its full line of pipe threading and cutting machines, pipe and nipple threading machines, stationary pipe die heads, pipe and nipple threading die heads and automatic screw cutting die heads.

Plan Permanent Exhibit of Machinery

A twenty-story machinery building covering an entire city block and costing between three and five million dollars is planned for Chicago's near west side. It will be called "The Machinery Arcade" and space will be leased to machinery firms and allied branches for show rooms and offices. It will be open every day in the year and guides will conduct visitors through the machinery exhibits.

Club rooms, a limited number of sleeping rooms, and an extensive collection of technical books will be provided for the tenants. All leases are to be approved by a representative committee selected from the machinery industry.

Imports Show Big Gain

Imports of metal-working machines during December were valued at $27,038. This compares with $16,760, the value of machine tools imported during December of 1921. December import figures only are available at this time due to the delays incident to the changes in import duties.

Book Reviews

Tool Engineering—Fixtures for Turning, Boring and Grinding. By Albert A. Dowd and Frank W. Curtis, president and chief engineer, respectively, of the Dowd Engineering Co., New York, N. Y. First edition, 340 pages, 216 illustrations, 6x9 in., blue clothboard covers. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York, N. Y. Price, $3.50.

This book is the second of three volumes covering the general subject of tool design. It treats of the design of tools and fixtures for turning, boring and grinding operations, while the first volume dealt with jigs and fixtures, and the last will cover the design of punches and dies and gages for production work.

The subject matter is presented in much the same manner as in the previous volume, and the work is sufficiently comprehensive to serve as both a reference and a text book. The information given is thoroughly practical and directly applicable to the work done in most tool and production shops.

The important points of design are taken up and developed with the idea of giving the principles involved, rather than unessential details. A foundation is laid for the reader that enables him to know the reasons why things should be done a certain way, and to analyze the problems in design. He can then supply the details to fit each case. The examples illustrated and explained show the details necessary to enable the designer to complete designs from the instructions, although unnecessary detail and undue repetition have been left out so as to shorten the treatment. The treatment of the topics is, in general, both complete and concise. The subdivision of chapters is a point that tends to give ease in referring to the treatment of a certain subject.

After considering the general principles of lathe tooling, chucks and special fixtures for holding the work are treated. All types of lathe cutting tools and their holders are covered in the succeeding chapters. Tooling for vertical lathes and boring mills is then discussed and the book ends with a chapter on grinding fixtures. Examples taken from the broad experience of the authors are given for each point, to illustrate both principles and details of design. The volume can be recommended as giving both the theoretical and the practical sides of design work, and as being a thorough treatise on present day methods of tooling for the manufacture of work by turning, boring and grinding.

Forthcoming Meetings

National Metal Trades Association. Twenty-fifth annual convention to be held at Hotel Astor, New York City, April 18 and 19. L. W. Fischer, secretary.

Society of Industrial Engineers, Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

American Gear Manufacturers' Association. Seventh annual meeting April 19, 20 and 21, Hotel Cleveland, Cleveland, Ohio.

American Welding Society, annual meeting. Engineers' Building, New York City, April 24 to 27.

National Foreign Trade Council. Annual meeting at the Grunewald Hotel, New Orleans, La., May 2, 3 and 4, 1923. O. K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Chamber of Commerce. Annual meeting, New York City, May 7 to 10. Julius Barnes, president.

American Association of Engineers. Annual convention, Norfolk, Va., May 7 to 9. C. E. Drayer, 63 East Adams St., Chicago, Ill., secretary.

National Association of Manufacturers. Annual convention. Waldorf-Astoria Hotel, New York City, May 14-15-16. General offices, 50 Church St., New York City.

National Association of Purchasing Agents. Annual convention, Cleveland, May 15 to 18. H. R. Heydon, 19 Park Place, New York City, secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society of Mechanical Engineers. Spring meeting at Montreal, Can., May 28 to 31. Calvin W. Rice, 29 W. 39th St., New York City.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., June 14 and 15. Hotel reservations through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Steel bar mills congested with volume of new business; prices somewhat higher at $2.50@$2.80 per 100 lb., Pittsburgh, on specified deliveries. Many producers refusing new orders. Shapes, $2.45@$2.70 at mill; leading interest unable to handle new tonnages. Plates firm at $2.50@$2.75 on new business for prompt delivery. Railroad car material in heavy demand at plate mills. Steel sheets, black, up 25c. per 100 lb., f.o.b. Pittsburgh.

Lead resisting downward pressure exerted on most other non-ferrous metals; up ¼c. per lb. in New York warehouses since last week. Copper sheets rose 1c.; brass sheets and wire, ¼c. and brass rods, ⅛c. per lb., in week. Raw linseed oil, $1.13 as against $1.10, f.o.b. New York; $1.22 in Cleveland, up from $1.15 per gal. in 5 bbl. lots.

Declines—Basic pig-iron market quiet in Pittsburgh and Philadelphia, with some minor price reductions. Pig-iron output at new high record in history of industry. Copper market dull; tin inactive, with zinc driving rapidly downward. Tin down 1⅛c. per lb., antimony, ¼c. per lb. and zinc, 15c. per 100 lb., in New York warehouses during week.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	32.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.94
BIRMINGHAM	
No. 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	33.76
Virginia No. 2	34.17
Basic	30.75
Grey Forge	31.00
CHICAGO	
No. 2 Foundry local	32.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	31.00
Basic	31.00
Bessemer	31.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.0
Cleveland	5¼@6¼
Cincinnati	4@6
New York	5¼@5¾
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.65@3.25	4.34	3.90	4.15
No. 12	2.75@3.35	4.39	3.95	4.20
No. 14	2.85@3.45	4.44	4.00	4.25
No. 16	3.05@3.65	4.54	4.10	4.35
Black				
Nos. 17 and 21.	3.35@3.85	4.70	4.55	4.85
Nos. 22 and 24.	3.40@3.90	4.75	4.60	4.85
Nos. 25 and 26.	3.45@3.95	4.80	4.65	4.90
No. 28	3.50@4.00	4.9	4.75	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00@4.25	4.90	4.80	5.10
Nos. 12 and 14.	4.10@4.35	5.00	4.90	5.20
Nos. 17 and 21.	4.40@4.65	5.30	5.20	....
Nos. 22 and 24.	4.55@4.80	5.45	5.35	5.65
No. 26	4.70@4.95	5.60	5.60	5.80
No. 28	5.00@5.25	5.90	5.90	6.10

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	64	52½	⅜ to 1½	30	13
		LAP WELD			
2	57	45½	2	23	7
2½ to 6	61	49½	2½ to 4	26	11
7 to 8	58	45½	4½ to 6	28	13
9 to 12	57	44½	7 to 12	26	11
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	62	51½	⅜ to 1½	30	14
2 to 3	63	52½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	55	44½	2	23	9
2½ to 4	59	48½	2½ to 4	29	15
4½ to 6	58	47½	4½ to 6	28	14
7 to 8	54	41½	7 to 8	21	7
9 to 12	48	35½	9 to 12	16	2

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	54%	41%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	51%	38%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 5%. Cast iron, standard sizes, 25% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.69	4.51	4.55
Cold rolled strip steel	7.00	8.25	7.25
Floor plates	5.65	5.46	5.80
Cold finished shafting or screw	4.20	3.90	4.30
Cold finished flats, squares	4.70	4.40	4.80
Structural shapes (base)	3.44	3.31	3.30
Soft steel bars (base)	3.34	3.21	3.20
Soft steel bar shapes (base)	3.34	3.21	3.20
Soft steel bands (base)	4.14	3.61	3.95
Tank plates (base)	3.44	3.31	3.30
Bar iron (3.00 at mill)	3.34	2.91	2.92½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
⅛	8.50		14.00
⅛	7.35		12.25
5/32 to ¼	7.10		11.00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			18.00
Tin, 5-ton lots, New York			47.50
Lead (up to carlots), St. Louis	8.20;	New York,	8.87½
Zinc (up to carlots), St. Louis	7.60;	New York,	8.10

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-ton lots	26.20	28.00	28.50
Antimony (Chinese), ton spot	10.12½	11.50	10.50
Copper sheets, base	26.00	25.50	23.00
Copper wire (l.c.l.)	19.62½	22.00	16.25
Copper bars (l.c.l.)	23.75	25.25	19.50
Copper tubing (l.c.l.)	28.00	30.25	23.00
Brass sheets (l.c.l.)	21.75	25.25	18.75
Brass tubing (l.c.l.)	26.50	30.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (carlots)	20.00	22.25	15.75
Brass wire (carlots)	22.25	22.00	.....
Zinc sheets (casks)	11.50	11.25	.....
Solder (½ and ½), (caselots)	37.00	32.00@34.00	20.00
Babbitt metal (83% tin)	65.00	59.00	36.00
Babbitt metal (35% tin)	40.00	18.50	.....
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	14.75@15.25	14.00	15.50
Copper, heavy, and wire	14.50@15.00	13.50	14.50
Copper, light, and bottoms	12.50@13.00	12.00	13.50
Lead, heavy	6.25@ 6.75	6.50	7.25
Lead, tea	5.75@ 6.00	5.00	6.25
Brass, heavy, yellow	8.75@ 9.00	....	9.25
Brass, heavy, red	12.25@12.75	12.00	12.50
Brass, light	7.25@ 7.75	7 50	8 25
No. 1 yellow brass turnings	8.75@ 9.00	8.50	9.00
Zinc	5 00@ 5.50	4.50	4.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	22.00	18.25	18.50
IX,	20x28, 112 sheets	24.50	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	19.50	16.00	17.00
IX,	20x28, 112 sheets	22.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	13.00	12.20	14.50
IC,	112 sheets	13.30	12.60	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.30	7.25
IC,	14x20	7.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11½
Cotton waste, colored, per lb.	.07@.12	.12	.08
Wiping cloths, 13½x13½, per lb.	.16	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	52.00 per M	.13
Sal soda, 100 lb. lots	2.65	3.50	2.65
Roll sulphur, per 100 lb	2.90	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.13	1.10	1.25
White lead, dry or in oil	100 lb. kegs.	New York, 14.25	
Red lead, dry	100 lb. kegs.	New York, 14.25	
Red lead, in oil	100 lb. kegs.	New York, 15.75	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton		$7.75
Coke, prompt foundry, Connellsville	per net ton		8.30

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	45%	40-5%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	65-10%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	4.50	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	1.00	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	1.00	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	50-10%	60%
Rivets, tinned	50%	50-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1½ to 1⅝-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	50%	35%	50%
Copper burs	30%	35%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60%	50-10%	40-10%
Second grade	65%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Mobile—Bender Welding Co., 56 St. Louis St.—machine shop and welding equipment.

D. C., Wash.—Southern Ry., 1300 Pennsylvania Ave., C. R. Craig, Genl. Purch. Agt.—list of machine tools, including lathes, punches, hammer, bending rolls and drill press.

Ill., Bushnell—Bushnell Record—power metal saw.

Ill., Chicago—Baird Lock Co., 216 West Ontario St.—No. 2 Brown & Sharp automatic screw machine.

Ind., Indianapolis—C. Zenn, 509 Virginia Ave.—sheet metal working equipment.

Ia., Waterloo—J. H. Hadley, 521 Vermont St.—drill press and automobile air pumping machine for proposed garage.

Kan., Augusta—Schoeb Motor Co.—machine shop equipment, including lathe, drill press, belting and hangers.

Kan., Halstead—Motor Inn, J. W. Foress, Purch. Agt.—power lathe (used).

Kan., Halstead — Roper Repair Shop, (garage), C. Roper, Jr., Purch. Agt. — power drill press with base or stand (used).

Kan., Sedgwick — Farmers' Blacksmith Shop, Main St., (machine and blacksmith shop), R. McAfee, Purch. Agt.—lathe, belting, hangers, bearings, pulleys and automatic cylinder boring machine (used).

Kan., Wichita—S. W. Coole, 410 North Main St.—power cylinder grinder, belting and hangers for garage (used).

Kan., Wichita — Guarantee Motor Co., 2117-2119 South Lawrence St., C. R. Cobb, Purch. Agt.—power lathe (used).

Kan., Wichita — E. Jacques, Avenue B, North—power lathe, drill press, hangers, belting and pulleys for garage.

Kan., Wichita—Osage Garage, 115 North Osage St., P. Schoak, Purch. Agt.—belting and power lathe.

Kan., Wichita—C. Ramsey, Rear of 435 North Main St.—power drill press, lathe and emery stand for garage.

Kan., Wichita — Roy Reeves Shop, 722 West Douglas Ave. (machine shop) — power drill press.

Kan., Wichita—Tullis & Davidson, 701 North Main St., (tin shop and furnace), F. Tullis, Purch. Agt.—tinners brake and power drill press (used).

Ky., Louisville—United States Engineer Office—one pile hammer, double acting, for driving wood 2 x 10 ft. sheet piling, weight 145 lb., weight of ram 21 lb., bore 2¼ in., stroke 3½ in., for delivery f.o.b. Addison.

Mass., West Newton (Boston P. O.)—J. Ruddick, 42 Auburn St. (machine shop)—one medium size bench or portable drill for blacksmith's use, also miscellaneous small tools, possibly larger tools, including drills, lathes, planers, keyseaters, etc.

Mich., Detroit—Cadillac Mchy. Co., Lafayette and Beaubien Sts.—No. 2 and No. 14 Colburn single spindle drills.

Mich., Detroit—Chadwick McClare Co., 31 East Woodbridge St. (machine shop)—one dividing head about 10 in. for Universal milling machine.

Mich., Holland—Federal Stamping Co.—stamping equipment, including heavy presses, drills, etc., for 60,000 sq.ft. of floor space.

Mo., Kansas City—Hatfield & Son, Room 313, Terminal Trust Bldg., 31st and Main Sts. (general contractors), L. I. Hatfield, Purch. Agt.—bar bending machine and an electrical hoist, 2 drum, 1,000 ft. ¾ in. cable.

Mo., Kansas City — New York Garage, 2720 Cherry St., M. A. Kirk, Mgr.—automatic boring machine, lathe, air pumping machine and tank for free air.

Mo., St. Louis—S. J. Gast, 4583 Virginia Ave.—lathe, etc., for automobile repair shop.

Mo., St. Louis—St. Louis-San Francisco Ry. Co., Frisco Bldg., B. T. Wood, Vice Pres. and Purch. Agt.—machinery for shops at Monett, to replace that which was destroyed by fire.

N. Y., Adams Center — W. H. Owens (machine shop and garage)—power operated metal saw up to 4 x 4 in., also 150 lb. compressor and tank.

N. Y., Binghamton—H. C. Larrabee & Co., 12 Edwards St. (machine and motor repair)—15 in. single spindle vertical drill press.

N. Y., Binghamton—J. L. Morgan Co., 227 State St.—garage and repair shop equipment.

N. Y., Buffalo—D. Delmonto, 1537 Fillmore Ave.—garage and repair shop machinery, tools and equipment, including gasoline tank and pumps.

N. Y., Buffalo—G. C. Dewald, 152 Greenfield Ave.—garage and repair shop machinery, tools and equipment.

N. Y., Buffalo—Polson Mfg. Co., 1750 Main St.—20 or 24 in. back geared drill press.

N. Y., Elmira—B. Record Co., State and 2nd Sts. (machine shop, garage and motor parts)—one floor type radial drill and small drop hammer.

N. Y., Rodman—B. F. Wise Co. (machine shop and garage)—14 in. x 6 ft. quick change gear, pan bed, taper draw in and chuck, lathe (new or used).

N. Y., Utica—Poirier Heating & Plumbing Co., 1217 West St., J. P. Kowalski, Purch. Agt.—electrically operated punch press on steel sheets, 0000 gauge.

N. Y., Watertown—G. H. Baltz, 215 Coffeen St. (garage and machine repair)—power metal saw up to 6 x 6 and a vertical boring mill (new or used).

N. Y., Watertown—Black River Traction Co., West Main St., L. Schwerzman, Purch. Agt.—heavy duty 20 in. vertical drill.

N. Y., Watertown—Brandon & Brandon, 341 State St. (electrical and battery repair), F. J. Brandon, Purch. Agt.—milling machine, similar to Kempsmith No. 1.

N. Y., Watertown—G. F. Forrester, Court St. (welding, forging and brazing shop)—small drop hammer, 350 to 400 lb., for forge shop.

N. Y., Watertown—Waterman & O'Brien Co., Bway. Ave., (plumbing, tinning and heating plants), R. S. Waterman, Purch. Agt.—14 in. upright power drill.

O., Columbus—Columbus Die, Tool & Machine Co., 955 Cleveland Ave., H. H. Price, Mgr.—two 24 in. lathes, grinder and press.

O., Columbus — Schreiner-Davis Machine Co., 427 North Park St., (manufacturer of special machinery), F. W. Schreiner, Pres. —one turret lathe and one milling machine.

Pa., Erie—Skinner Engine Co.—machine tools and equipment.

Pa., Lancaster—Rowe Motor Car Mfg. Co., New Holland and Fountain Aves.—repair shop and garage machinery, tools and equipment, to replace that which was destroyed by $250,000 fire.

Pa., Lewistown—H. P. Gallagher and A. Ayre—garage and repair shop machinery, tools and equipment, to replace that which was destroyed by fire.

Pa., Parsons (Wilkes-Barre P. O.)—J. Fritges—sheet metal and tinware working equipment.

Pa., Phila.—Pennsylvania R.R., Broad St. Sta., S. Porcher, Genl. Purch. Agt.—one 48 in. planer and one 42 in. vertical punch.

Pa., Pittsburgh—Natl. Tube Co., Frick Bldg., S. M. Lynch, Purch. Agt.—one 12,000 lb. and one 6,000 lb. hammer.

Pa., Titusville—E. E. Fenton—machinery, tools and equipment, including tankage, for large gasoline and service station at Westfield, N. Y.

Pa., Williamsport—Amer. Air Stand Mfg. Co., E. M. Russell, Pres.—machinery and equipment, including threading and cutting machines, drill presses, grinders, etc., for plant for the manufacture of air and water dispenser machine at Montgomery.

R. I., Providence—Colwell Worsted Mills, Hartford Ave.—single shear, 66 in., Parks & Woolson (used).

Tenn., Memphis—Harstick Heating Co., 221 Jefferson Ave. (heating contractor and manufacturer of steam, hot water and hot air furnaces)—pipe threading and cutting machines, tinsmith's equipment and furnaces.

Tex., Dallas—J. W. Davis, 2810 Elm St. (machine shop)—No. 1 or No. 2 milling machine and a 30 ton punch press.

Tex., Dallas—J. Kelley, 1321 Grigsby St. (jeweler)—bench lathe.

Tex., Dublin—J. G. Damm (welder)—acetylene generator and torch, also one power hammer.

Wis., Fox Lake—Fox Lake Auto Co.—automobile repair machinery, including press, gasoline storage tanks and pumps.

Wis., Milwaukee—Delta Mfg. Co., 911 5th St. (automobile accessories)—medium size turret lathe and drill press.

Wis., Mount Vernon (Mount Horeb P. O.) —E. Zahler—automobile repair machinery, press, compressor, power machinery, belting and shafting for proposed garage and repair shop.

Wis., Oshkosh—Teela Sheet Metal Co., 346 Main St., R. J. Teela, Purch. Agt.—sheet metal machinery bender.

Machinery Wanted

Ark., Gurdon—The Times—perforator, punch and stitcher with power attachment.

Calif., Pasadena—The city, B. Chamberlain, City Clk.—receiving bids until Apr. 16 for (1) furnishing electrically driven crane with 50 and 10 ton auxiliary hooks; (2) same as item 1, only crane to be delivered and installed.

Calif., San Jose—The County of Santa Clara, H. Pfister, County Clk.—receiving bids until Apr. 16 for furnishing one Heil Hoist with all steel drum body, 4 yd. with double acting tail gate, installed on Liberty truck.

Calif., Torrance—Union Tool Co.—foundry equipment.

Calif., Vernon (Watts P. O.)—Consumers' Rock & Gravel Co., 26th St. and Vernon Ave.—equipment, including crushers, etc., for rock crushing plant, to replace that which was destroyed by fire.

Calif., Willits—E. P. Cotton, Box 302—power job printing press, belting, hangers and bearings.

Colo., Lamar—G. C. Harris (job printer) —linotype or intertype machine.

Fla., Auburndale—A. B. C. Job Printer—complete job printing equipment.

Fla., Panama City—Panama City Tar & Turpentine Co., J. Black, Genl. Mgr.—machinery and equipment for the manufacture of tar and turpentine.

Ga., Marietta—Times Pub. Co.—Goss or Duplex newspaper press and linotype.

Ga., Sylvester—B. M. Summer—ice manufacturing machinery and equipment.

Ill., Chicago—Commercial Furniture Co., c/o A. H. and H. W. Stringe, Mgrs., 2739 West Chicago Ave.—power, woodworking and special equipment for proposed $50,000 furniture factory for the manufacture of office suites, at Sheboygan, Wis.

Ill., Danville—The Printer, Box 5—8 x 12 in. or 10 x 15 in. Chandler & Price power job printing press.

Ill., Warrensburg—Bd. Educ.—vocational equipment for $80,000 school.

Ind., Brazil—The Times—Ludlow type casting machine.

Ind., South Whiteley—A. D. White—machinery and equipment for proposed $50,000 plant for the manufacture of steel cabinets and office filing equipment.

Ia., Lytton—W. A. Alexander—complete job shop equipment, including power job press, belting and hangers.

Kan., Eldorado—W. G. Lindley, R. R. 4, (milk bottling)—power bottling machine.

Kan., Esbon—E. Vaughn (job printer)—power perforator, Rosback preferred (used).

Kan., Sedgwick—Sedgwick Shoe Shop, B. E. Seitz, Purch. Agt.—automatic leather stitching machine (used).

Kan., Wichita—W. S. Moyer, 424½ North Main St.—cabinet mortiser.

Kan., Wichita—F. W. Schuler, 422 North Main St. (contractor)—power Universal saw.

Kan., Wichita—Wichita Furniture Hospital, 117 East Murdock St., B. R. Neuman, Purch. Agt.—power Universal saw (used preferred).

Ky., Louisville—Louisville Gas & Electric Co., 311 West Chestnut St.—equipment for proposed $750,000 gas plant.

Ky., Middlesboro—Kentucky Utilities Co.—50 ton electric ice making machine with auxiliary equipment.

Ky., Monticello—Bd. Educ.—vocational equipment for $80,000 school.

La., Gretna—Jeerson Parish School Bd.—vocational equipment for new school.

La., Youngsville—Youngsville Sugar Co.—sugar mill machinery.

Md., Baltimore—D. C. Elphinstone, 408 Continental Bldg. (machinery)—20 ton locomotive crane, M. C. B., 50 ft. boom; 18 ton locomotive, 36 in. gage; 5 ton stiff leg derrick; 3-drum hoist, 9 x 10 in. with or without boiler and appurtenances; caterpillar shovel, gas or steam operated, Erie, Type B preferred.

Md., Baltimore—Harvey Co., 113 South St. (machinery), A. Harvey, Purch. Agt.—10 ton traveling crane, 60 to 70 ft. span with motors.

Mass., East Pembroke—J. A. Loring—portable sawmill for use in woods (used).

Mass., South Boston (Boston P. O.)—S. Goldberg, 135 West 4th St. (woodworking)—one 24 to 30 in. surface planer, one 6 to 12 in. buzz planer and one medium size upright drill (used).

Mass., Worcester—Arcade Malleable Iron Co., Albany St., J. F. Way, Purch. Agt.—machinery for foundry in East Springfield district, including planing mill exhaust, Sturtevant No. 45 or similar; open door brick crusher, Sturtevant No. 1 or similar; eight 24 x 42 in. tumbling barrels; direct drive reducing gears; wire cutter and scraper; tractor crane with magnets; coal buckets.

Mich., Detroit — Birmingham Sand & Gravel Co., 2690 East Atwater St.—two 150 ft. conveyors, equipment, operating machinery, etc., for proposed storage warehouse.

Mich., Detroit—Dept. Purchases & Supplies, 700 Marquette Bldg., G. J. Finn, Comr.—1,000 emery blocks, 2¾ x 4 x 9½ in. for reciprocating grinder for the Dept. of Street Rys.

Mich., Detroit—Michigan Central R.R. Co., Michigan Central Terminal, B. A. Aikens, Purch. Agt.—supplies for repair shop, including sheets, black, galvanized and blue annealed; steel bars, shapes and plates; steel billets; spring steel; seamless steel tubes; crank pins and piston rods; bolts, machine and carriage; washers, cotters, keys and rivets.

Mich., Iron Mountain—Michigan Iron Land & Lumber Co.—conveyor system, fuel handling and special equipment for proposed wood distillation plant.

Minn., St. Paul—H. L. Hollister, 1500 Breda St.—job power press, belting, hangers, paper cutter and bearings.

Minn., Staples—E. D. Lum—complete newspaper equipment.

Mo., California—O. M. Hale (contractor)—truck scale, 8 to 12 ton.

Mo., Joplin—R. Blake, Room 204, Cosgrove Bldg. (mine operator)—two drill rigs.

Mo., St. Joseph—Print Shop, 2101 Seneca St.—power job printing press.

Mo., St. Louis—Voll Cooperage Co., Federal Reserve Bank Bldg., (manufacturer of tight barrel cooperage), V. W. Kraft, Purch. Agt.—equipment for stave plant at Corinth, Miss.

Mo., Thayer—C. W. Black (newspaper)—cylinder press.

N. J., Jersey City—H. Stone, 300 Ocean Ave.—one air hoist to lift 1,500 to 2,000 lb.

N. J., Newark—Public Service Co., Terminal Bldg., T. N. McCarter, Pres.—machinery for the production of dimension stone, also crushers for an output of 25 cars per day, for proposed granite quarry at Rolesville (Wake Forest P. O.), N. C.

N. Y., Afton—Borden Condensed Milk Co.—ice machinery and milk plant equipment, to replace that which was destroyed by fire.

N. Y., Albany—Federal Signal Co., Troy Co., Troy Rd.—additional foundry equipment.

N. Y., Brooklyn—S. W. Fromm, 93 Underhill Ave. (manufacturer of knit goods)—hosiery machine, single or double, section about No. 30 gauge (used).

N. Y., Buffalo—Black Rock Milling Corp., 356 Hertel St.—receiving bids for conveyor system. Cost between $16,000 and $18,000.

N. Y., Buffalo—C. Johnahl, 224 Allen St.—equiment for proposed plumbing shop.

N. Y., Buffalo—A. F. Meyers Corp., 298 Pratt St.—machinery and equipment for 2 story building for the manufacture of soda fountains, show cases, etc.

N. Y., Buffalo—Natl. Aniline Chemical Co., Abbott Rd.—machinery and equipment for chemical works, to replace that which was destroyed by fire.

N. Y., Buffalo—Tri-Me Mfg. Co., 206 High St. (windshields) — electric spot welder.

N. Y., Canandaigua — Central Sash & Door Mfg. Co., R. E. Pool, Purch. Agt.—tenoner.

N. Y., Cohoes—J. & P. Brush Co., R. W. Penny, Purch. Agt.—woodworking lathes and automatic forming machinery for brush backs.

N. Y., Dolgeville—Bd. Educ.—vocational equipment for $225,000 high school.

N. Y., Endicott—Endicott-Johnson Corp., (shoes), W. Mattaei, Supt. of Rubber Dept.—special machinery and equipment for the manufacture of rubber heels and soles.

N. Y., Gardenville — Bd. Educ. — vocational equipment for $125,000 school.

N. Y., Gouverneur—Northern Ice Cream & Bottling Co., C. W. Bame, Purch. Agt.—bottle filling machinery and equipment.

N. Y., Hamburg—Bd. Educ.—vocational equipment for $200,000 school.

N. Y., Hicksville—Bd. Educ.—vocational equipment for $200,000 school.

N. Y., Malone—Glazier Co., East Main St., C. E. Glazier, Purch. Agt. — electrically operated meat grinders.

N. Y., Newark—Newark Cold Storage Co., E. V. Pierson, 1st Natl. Bank, Purch. Agt.—complete mechanical equipment for 30 ton daily capacity ice plant.

N. Y., New York—A. G. Schoonmaker, 25 Church St.—three belted steam driven air compressors.

N. Y., Rochester—P. Enders & Son, 52 Rustic St. (woodworking)—single end tenoner, double cope heads and roller table (used).

N. Y., Scotia (Schenectady P. O.)—Bd. Educ.—vocational equipment for $270,000 school.

N. Y., Stillwater—H. J. Reilly—machinery and equipment for $100,000 plant for the manufacture of automobile headlights.

N. Y., Theresa—Hubert Calhoun Co. (sawmill and lumber)—6 in. heavy duty bandsaw with frame complete for log sawing.

N. Y., Tupper Lake—McCarthy & Twohey, P. H. McCarthy, Purch. Agt.—special machinery for the manufacture of concrete bricks and blocks.

N. Y., Utica—Oneita Knitting Mills, 851 Broad St., R. Daveraux, Purch. Agt. — special machinery for knitting cotton ribbed underwear.

N. Y., Watertown—Taggart Bros. Paper Co., West Main St., J. Taggart, Purch. Agt.—air compressor with sufficient pressure to operate rock drill, also air operated rock drill.

N. C., Franklinton — Bd. Educ. — vocational equipment for $165,000 school.

N. C., Greenville—Pitt Lumber Co.—machinery and equipment for proposed $50,000 lumber mill.

N. C., Oakboro — Oakboro Cotton Mill Co., J. A. Groves, Albermarle, Pres.—electrically driven equipment for 6,000 spindle cotton mill.

N. C., Waco—Rhodes Cotton Mills—5,000 spindles, 100 looms and other equipment for proposed cotton mill.

O., Columbus—Columbus Paint Co., 272 Kimball St., W. B. Peters, Genl. Mgr.—complete equipment for the manufacture of varnish.

O., Elyria—Hart Cookston Rubber Co.—40 to 50 in. Birmingham or Ferril rubber mill.

O., Lancaster—Herman Mfg. Co.—machinery and equipment for addition to plant for the manufacture of tire making equipment.

O., Masury—J. Naegel—tannery machinery and equipment.

O., Norwalk—Schauss Furniture Co.—woodworking machinery and equipment.

O., Salem—Victor Stove Co., C. E. Sweeney, Supt.—one 10 ton cupola, one ton elevator for loading cupola, 1½ ton chain hoists, dust separator, line shaftings, pulleys and belting.

Okla., Colony—Colony Commercial Club—cotton gin.

Okla., Cushing—Cushing Ice Co.—ice making machinery and ammonia cylinders.

Okla., Tonkawa — T. Tantamos — large power newspaper press.

Ore., Hillsboro—Ray-Maling Canning Co.—canning machinery and belting for proposed $50,000 factory.

Ore., Portland—Willamette Iron & Steel Wks., A. G. Labbe, Pres.—bandsaws for addition to plant.

Pa., Auburn—Auburn Knitting Mills—Wildman 12 cut cylinders and dials for 14-15-16 in. knitting machines.

Pa., Erie—Erie Lithographing & Printing Co., 10-28 West 4th St.—conveying machinery and other equipment for new plant.

Pa., Jeannette—Pittsburgh Eng. Co.—equipment for proposed plant for the manufacture of machinery.

Pa., Kittanning—Louden Tool Co., Water St.—crane for new warehouse.

Pa., Lawrenceville — G. A. Schnabel & Sons, 25th St. and Pennsylvania Ave.—machinery and equipment for wagon works.

Pa., Marcus Hook—Viscose Co.—machinery and equipment for $3,000,000 silk plant.

Pa., North Girard—Eclipse Mfg. Co.—machinery and equipment for the manufacture of clothes and novelties, to replace that which was destroyed by fire.

Pa., Pittsburgh—Koppers Co., Farmers Bank Bldg. (byproduct ovens)—cranes and pushers for new plant at Warren, O.

Pa., Pittsburgh — McKenney Mfg. Co., Metropolitan and Liverpool Sts. (hardware, hinges and builders' hardware)—transfer cranes, 14 ft. span; 5 ton monorail hoist.

Pa., Pittsburgh—Pittsburgh & Lake Erie R.R., South Smithfield St., C. M. Yohe, Purch. Agt.—one pillar crane.

Pa., Susquehanna—W. C. Deakin—ice cream making machinery and equipment.

Pa., Tionesta—Tionesta Silver Fox Ranch—cold storage and refrigeration machinery and equipment.

Pa., Upper Darby (Phila. P. A.)—Bd. Educ.—vocational equipment for $200,000 school.

R. I., Providence—New England Hosiery Co., Inc., 34 Bassett St.—hand lever steam hosiery press, size 36 to 60 in.

S. C., Greenwood—Greenwood Cotton Mill Co.—textile machinery for $500,000 cotton mill.

S. D., Parker—New Era Printing Co.—Whitlock newspaper press for 7 or 8 columns.

Tenn., Athens—Athens Plow Co., H. L. Wilson, Secy.—foundry equipment.

Tenn., Chattanooga—Dixie Spinning Mills—complete machinery for the manufacture of yarn.

Tenn., Nashville—State Purch. Dept.—machinery for the manufacture of automobile license plates at the state prison.

Tex., Corsicana—A. B. Miller (oil operator)—drill rig.

Tex., Fort Worth—Herbert Oil Co., 359 Majestic Bldg.—$50,000 worth of oil field equipment, including pumping machinery, etc.

Tex., Ysleta—C. C. Crickett—newspaper press, paper cutter, belting, hangers, linotype and shafting.

Va., Clarendon (Wash., D. C. P. O.)—Bd. Educ.—vocational equipment for $190,000 school.

Wash., Spokane—Eggers Pole & Supply Co., Paulsen Bldg., G. C. Eggers, Pres.—machinery for treating and creosoting cedar poles.

W. Va., Glenville—Hall, Smith & Hall, J. H. Hall, Mgr.—compressed air outfit, also gas and oil pumps for garage.

W. Va., Welch—Bd. Educ.—vocational equipment for $150,000 school.

W. Va., Weston — Lewis County Cut Glass Co., L. Wohinc, Mgr.—belting, pulleys and shafting.

Wis., Casco—A. Heim—electrically driven shoe repair machinery, including buffers, stitchers and sander.

Wis., Delevan—Bradley Knitting Co., B. Tyrrell, Purch. Agt.—looping machines seamers, stitchers and motors for branch factory at Beloit.

Wis., Fox Lake—Fox Lake Auto Co.—gasoline storage tank and pump for proposed garage.

Wis., Green Bay—Sheboygan Dairy Products Co., 134 South Adams St., E. H. Regal, Mgr.—ice machine, refrigerating, power and creamery machinery, including churns.

Wis., Madison — F. J. Hoffman, 2136 Regent St.—refrigeration equipment, also meat grinding and slicing machinery.

Wis., Manitowoc—Aluminum Goods Mfg. Co., 15th and Franklin Sts., H. Vito, Mgr.—coal handling machinery and coal bunkers for proposed boiler house.

Wis., Merrill—Peterson & Juul, Lawson Bldg.—gasoline storage tank and pump for proposed addition to garage.

Wis., Milwaukee—E. B. Gennrich, 717 46th St. (castings)—large electric furnace.

Wis., Milwaukee—S. Schneidermann, 779 3rd St.—power electrically operated baking equipment, including mixers, sifters, conveyors and mechanical oven.

Wis., Milwaukee—C. F. Sultemeyer, 728 52nd St. (forgings)—equipment for one forge furnace.

Wis., Milwaukee—F. E. Thellacker, 456 Bway.—large stamping machine to stamp out standard size composition shingles.

Wis., Milwaukee—C. Thomsen, 237 Cambridge Ave.—air compressor gasoline storage tank and pump for proposed $40,000 garage on Farwell Ave.

Wis., Milwaukee—Water Dept., c/o P. H. Bohmann, City Hall—one traveling crane, approximately 25 ton.

Wis., Milwaukee—Western Leather Co., 878 Marshall St. (tannery), F. H. Fiedler, Purch. Agt.—one light traveling crane.

Wis., North Milwaukee — E. B. Korth, Route 5 (carpentry and millwork)—one combination woodworking machine.

Wis., Oconto Falls — Falls Canning Co., C. F. Meyer, Pres.—canning machinery and conveyors for proposed $75,000 plant.

Wis., Pardeeville—Bd. Educ., J. Chandler, Dir.—small tools and manual training equipment for proposed high school.

Wis., Pickett—Wisconsin State Canners Co., F. J. Umbreit—canning machinery, including cookers, sealers and can filling machinery.

Wis., South Milwaukee—Bucyrus Co. (manufacturer of steam dredges)—crane.

Wis., Spooner—J. F. Chase, Route 1—creamery machinery, including power operated churn, separator, belting, etc.

Wis., Waukesha—Quality Aluminum Co., c/o A. C. Pankratz, 505 Lake Ave.—equipment for proposed aluminum foundry.

Man., Fort Alexander—Manitoba Pulp & Paper Co.—equipment for proposed pulp mill.

Ont., Cobalt—Crown Reserve Mining Co.—gold mill, consisting of crushers, stamps, cyanide apparatus, tube and ball mill, pumps, etc., for mine at Pancake Lake in the Larder Lake Gold Dist. (Matheson Sta. P. O.).

Ont., Owen Sound—Owen Sound Elevator Co., Ltd., E. W. McQuay, Pres. — grain handling equipment for proposed $750,000 elevator.

Ont., Stratford—Ontario Imperial Burners, Ltd., J. P. Loughlin, Mgr.—equipment for the manufacture of oil burners.

Ont., Timmins — Vipond Consolidated Mines—crushers, stamps, tube and ball mills, cyanide equipment and pumps to increase capacity of gold mill to about 400 ton.

Ont., Walter's Falls—W. Bonnell—equipment for flour mill, to replace that which was destroyed by fire.

Que., Montreal—Charbonneau & Deguise, 636 Craig St., M. Charbonneau, Purch. Agt. complete shoe manufacturing equipment to replace that which was destroyed by fire.

Que., Montreal—La Duchesse Shoe Mfg. Co., Ltd., 39 Beaudry St., D. F. Desmarais, Purch. Agt.—complete shoe manufacturing equipment, to replace that which was destroyed by fire.

Que., Montreal — J. A. Whittaker, 723 Dorchester St.—cement mixer, small bandsaw, woodworker and shaper.

Metal Working Shops

Calif., San Francisco — The Millbrae Dairy, 834 Octavia St., awarded the contract for structural steel and cast iron work of a 1 and 2 story garage and dairy on McAllister St. near Octavia St. Estimated cost $23,194, ultimate cost will exceed $40,000.

Calif., San Pedro—The Pacific Coast Borax Co. awarded the contract for the construction of a 3 story factory and a 1 and 2 story machine shop and boiler house. Estimated cost $415,000. Noted Mar. 1.

Conn., Hartford—The Veeder Mfg. Co., 20 Sargeant St., manufacturer of cyclometers, counters, etc., awarded the contract for the construction of a 1 story, 80 x 150 ft. addition to its factory. Estimated cost $50,000.

Ill., Centralia—The Pfeffer Garage Co. awarded the contract for the construction of a 2 story garage on Main St. Estimated cost $60,000. Noted Feb. 1.

Ill., Chicago — Fox & Fox, Archts., 38 South Dearborn St., are receiving bids for the construction of a 1 story, 105 x 300 ft. factory on South Kedzie St. near Drainage Canal, for N. F. Brenner, of Amer. Insulated Wire & Cable Co., 954 West 21st St. Estimated cost, including machinery, $200,000.

Ill., Chicago—H. A. Muider, Archt., 140 South Dearborn St., is receiving bids for the construction of a 1 story, 100 x 125 ft. amtomobile sales and service station at 4143-53 Milwaukee Ave. for Cooper & Kirk, c/o Architect. Estimated cost $40,000.

Ill., Chicago—G. Rosen, c/o Halperin & Braun, Archts., 19 South La Salle St., awarded the contract for the construction of a 1 story, 126 x 140 ft. garage at 6415-25 Bosworth Ave. Estimated cost $50,000.

Ind., South Whitley—A. D. White plans to build a factory for the manufacture of steel cabinets and office filing equipment. Estimated cost $50,000. Engineer or architect not announced.

Ia., Waterloo—J. H. Hadley, 521 Vermont St., awarded the contract for the construction of a 2 story, 40 x 160 ft. garage on 5th and Jefferson Sts. Estimated cost $40,000.

Ky., Central City—The J. Barnes Auto Co. will soon award the contract for the construction of a garage. Estimated cost $40,000. Marr & Holman, Stahlman Bldg., Nashville, Tenn., Archt. Noted Mar. 22.

La., Baton Rouge—The Capital City Auto Co., 829 St. Charles St., New Orleans, is having plans prepared for the construction of a 2 story, 95 x 105 ft. garage and automobile sales room on Main and Menard Sts., here. Cost will exceed $25,000. Jones, Roessle & Oldschner, Maison Blanche, New Orleans, Archts.

Me., Rumford—B. F. Wheeler, Archt., c/o owner, is receiving bids for the construction of a 1 story, 100 x 110 ft. car repair shop, at freight yards here, for the Maine Central R.R., Portland. Estimated cost $50,000. Noted Jan. 25.

Mass., Boston—The city, Public Bldgs. Dept., City Hall, plans to build a municipal service station and automobile repair shops on Albany St. Estimated cost $150,000. Engineer or architect not announced.

Mass., Boston—H. Norman, 20 Lawrence Ave., Roxbury (Boston P. O.), will soon award the contract for converting a 5 story building into a garage and service station at 27-36 Endicott St. Estimated cost $40,000. S. S. Eisenberg, 40 Cornhill St., Archt.

Mich., Grand Rapids—Gallinger & Livingston, 541 Paris St., S. E., awarded the contract for the construction of a 1 story, 100 x 300 ft. machine shop on Wealthy St. Estimated cost $35,000.

Mo., St. Louis—The Sybilline Realty Investment Co., Title Guaranty Bldg., awarded the contract for the construction of a 1 story, 150 x 152 ft. factory for a brass company, on Duncan Ave. Estimated cost $50,000.

N. J., Trenton—The Reeves Fdry. Co., Parker Ave., awarded the contract for the construction of a 1 story, 50 x 100 ft. foundry on North Logan Ave. Estimated cost $8,000.

N. Y., Albany—The Federal Signal Co., Troy Rd., plans to build additions to its plant, including foundry. Cost will exceed $40,000.

N. Y., Long Island City—H. J. Leverick, c/o J. DeHart, Engr. and Archt., 1039 Fox St., New York City, will build a 1 story, 100 x 120 ft. garage on 2nd Ave., here. Estimated cost $50,000.

N. Y., New York — Hendry Bros., c/o Vitolo & Calhane, Engrs. and Archts., 56 West 45th St., will build a 1 story, 185 x 500 ft. garage on Webster Ave. near 202nd St. Estimated cost $125,000.

N. Y., Rochester—The Rochester Realty Corp. plans to build a 2 story, 135 x 445 ft. garage, office and storage building at 433 St. Paul St. Estimated cost $150,000.

N. Y., Stillwater—H. J. Reilly plans to build a large plant for the manufacture of automobile headlights. Estimated cost $100,000.

N. Y., Watertown — The Northern New York Utilities Co., 58 Public Sq., plans to build a 2 story garage and machine shop on Front St. Estimated cost $40,000. S. D. Gilbert, Light & Power Bldg., Mgr.

O., Cleveland—The Plotz Iron Wks., 1411 St. Clair Ave., awarded the contract for the construction of a 1 story, 30 x 31 ft. addition to its factory. Estimated cost $10,000.

O., Youngstown—The Ousley Co., Archts., Mahoning Bank Bldg., will soon receive bids for the construction of a garage for the Van Baalen Auto Co., Wick and Rayen Aves.

Ore., Portland—The Willamette Iron & Steel Wks., foot of Front St., is having plans prepared for the construction of a 1 story, 50 x 100 ft. addition to its plant. Estimated cost $25,000. A. G. Labbe, Pres. J. F. Hoss, c/o owner, Engr.

Pa., Jeannette—The Pittsburgh Eng. Co. plans to build 3 additions to its plant for the manufacture of machinery. Estimated cost $200,000. Engineer or architect not announced.

Pa., Jersey Shore—The Amer. Air Stand Mfg. Co. plans to build a 2 story, 50 x 150 ft. first unit of plant for the manufacture of air and water dispensers for gasoline and automobile supply stations, on Main St. Estimated cost $50,000.

Pa., Phila.—P. Kuhn, Archt., 3058 North 8th St., is receiving bids for the construction of a 1 story, 69 x 100 ft. garage on Front and Thompson Sts. for G. Fellman, 1253 North Front St. Estimated cost $60,000.

Pa., Pittsburgh—C. J. Allen, c/o City Deposit Bank, 6112 Penn Ave., is having plans prepared for the construction of a 1 story, 175 x 296 ft. garage on Western Ave. Estimated cost $60,000. Private plans.

Pa., Pittsburgh—The Oberndorf Mfg. Co., Thomas Blvd., manufacturer of plumbers' specialties, awarded the contract for the construction of a 1 story, 50 x 120 ft. addition to its factory.

R. I., Providence—M. W. Norton, Dorrance St., awarded the contract for the construction of a 3 story addition to garage and service station. Estimated cost $75,000. Noted Mar. 22.

Tenn., Memphis—The Harstick Heating Co., 221 Jefferson Ave., heating contractor and manufacturer of steam, hot water and hot air furnaces, awarded the contract for the construction of a 1 story, 27 x 132 ft. plant at 236-238 Adams Ave.

Tex., Houston—The International & Great Northern R.R., Mason Bldg., plans to expend $250,000 for shops and tools, also $1,400,000 for new steel in connection with its $3,500,000 program. F. S. Schwinn, Ch. Engr.

Wash., Seattle — The Washington Iron Wks., Seattle Blvd. and Norman St., is building a $200,000 plant and will add a 126 x 572 ft. machine shop, costing $75,000.

Wis., Beloit—The Gaston Scale Co., 715 2nd St., awarded the contract for the construction of a 2 story, 40 x 68 ft. scale factory, to replace the one which was destroyed by fire. Estimated cost $40,000. Noted Jan. 25.

Wis., Hammond — C. Datwyler plans to build a 1 story, 50 x 122 ft. garage, repair and machine shop. Estimated cost $40,000. Engineer or architect not selected.

Wis., Madison—G. E. and A. Gill, 215 West Washington Ave., plan to build a 2 story garage and repair shop on Webster St. Estimated cost $80,000. Engineer or architect not selected.

Wis., Madison—F. L. Kronenberg, Archt., Carroll Block, is receiving bids for the construction of a 2 story, 66 x 165 ft. garage on Washington St. for the Capital City Garage Co., South Pinckney St. Estimated cost $60,000. Noted Dec. 28.

Wis., Milwaukee—M. R. Hayes, 97 Wisconsin St., awarded the contract for the construction of a 1 story, 80 x 152 ft. garage on Cambridge Ave. Estimated cost $45,000. Noted Mar. 1.

Wis., Milwaukee—The Wisconsin Magneto Co., 528 Milwaukee St., awarded the contract for the construction of a 1 story, 90 x 120 ft. service station on Van Buren St. Estimated cost $48,000. Noted Mar. 22.

Wis., Plymouth—E. A. Juul, Archt., Security Bldg., Sheboygan, is receiving bids for the construction of a 1 story, 60 x 150 ft. garage and repair shop, here, for J. Mattey. Estimated cost $50,000.

Wis., Sheboygan—E. A. Juul, Archt., Security Bldg., is receiving bids for the construction of a 2 story, 60 x 100 ft. garage and repair shop on Center Ave. for F. Hensel & Co., North 7th St. and Center Ave. Estimated cost $50,000. Noted Mar. 1.

Wis., Sheboygan—J. Van der Vaart, 533 Pennsylvania Ave., plans to build a 4 story, 60 x 120 ft. garage and repair shop. Estimated cost $70,000. Engineer or architect not selected.